

DES to monitor giving of discretionary awards

by Frances Gibb
The Department of Education and Science is to monitor the allocation of discretionary awards by local authorities. In answer to a parliamentary question this week, Mrs Williams, the Secretary of State for Education and Science, said she was concerned by indications that the awards for next year would be sharply reduced.

Figures for 1975-76 indicate that about 27 per cent more was spent on some 50,000 discretionary awards. However, an earlier figure was available. Local authorities were free to make their own decisions both in the number and the level of discretionary awards. Mrs Williams said, and she had no information yet about their policies for 1977-78.

Tuition fee occupations end

Most university and polytechnic occupations over Government plans to increase tuition fees ended this week. Many have set up joint student/staff negotiating bodies to ensure the new levels do not force students to leave courses.

Among the universities where some fee concessions have been made are York, which has agreed not to implement the new levels in special cases; Durham, which has given a commitment that no student will be obliged to leave his course; and the London School of Economics, which has agreed that the school should set aside £70,000 for a hardship fund.

Top medical schools' protest makes DHSS change mind

continued from page 1
Authority, which has one of England's biggest teaching and research commitments, revealed that as a direct result of the DHSS letter, an unpublicised meeting of the University Liaison Committee had been arranged at short notice.



Eyeball to eyeball: Mrs Williams and Mr Derek Robinson, SSRC chairman.

Applications for research 'are slipshod'

Social scientists were chided by Mrs Williams, the Secretary for Education, last week for the "generally slipshod" way in which some of them applied for public money for research.

OU plans link with California

The Open University is planning to enter into a major agreement with the University of California, involving the production of 16 television programmes for use in Britain and America.

Italy shaken by riots

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The government's statistical office, on the other hand, puts the total at 777,000, of whom 640,000 are under 30. There is no figure for graduates. But an association of unemployed graduates estimates the total as three million.

Decline of part-timers to continue

by David Walker
Numbers of part-time students in polytechnics will continue to decline as these institutions concentrate on advanced work, according to figures underpinning this year's Rate 5 report.

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Czechs use university entry as 'reward for conformity'

by Annabel Ferriman

Major allegations of political discrimination in selecting students for university in Czechoslovakia have been made by the "Charter 77" group of dissidents.



A Czechoslovak student reminisces with a Russian soldier in the streets of occupied Prague nine years ago.

The group, which is calling on the Czechoslovak Government to implement in full the United Nations Declaration on Human Rights, maintains that universities are refusing to accept children of supporters of the revolution and of workers, even though these children were only 10 or 11 years old in 1968.

The document states: "Entry into secondary schools and universities is now determined not only by the objective assessment of the ability, talent and intellectual of the candidate, and by the correct use of talent, but is predominantly used as a reward for political 'activism' and conformity, and as a punishment of parents for their views. If they are out of step with current political practice.

"Instead of talented applicants, the schools and universities today accept below-average students who are, in whose parents are, politically active, and conformist, either sincerely or hypocritically, and who are willing to accept and support everything that the present Government proclaims."

UGC warning on 'lost horizons'

by Frances Gibb

The universities are suffering a deep sense of uncertainty which can be removed only by the restoration of a longer planning horizon, the University Grants Committee says in its annual report for 1975/76.

Composer teaches

Sir Michael Tippett, the English composer, has taken up a week's residence at the University of Cambridge.

Patterns of equality

The title of Dr Guy Noyes' book on the post-war development of higher education in England is *Patterns of Equality*, not *Inequality* as stated in the last week.

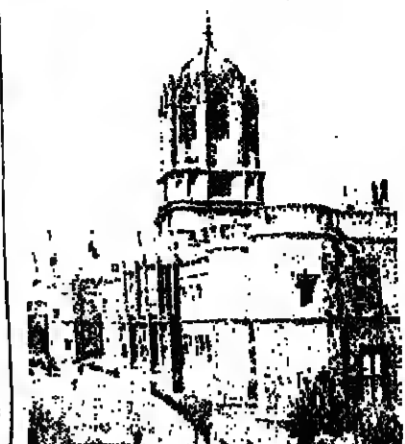
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Oxford's condition



In a special four-page report Peter Wilby looks at Oxford today, its academic standards and capacity for innovation, and its tangled finances. 6-9

Profiles of Balliol, St. Peter's, St. Edmund Hall, Nuffield, Christ Church and St. Anne's. 8-9

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Richard Hoggart reflects on the changed atmosphere in universities and colleges after five years at UNESCO, 15

Students today

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Chemistry's century

The Royal Institute of Chemistry is 100 years old next week. Leslie Halliwell describes its achievement, 10

Through Russian eyes

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OU in talks on transfer scheme

by Sue Reid

The introduction of a credit transfer scheme, allowing the movement of students between the Open University and traditional university courses, is to be examined at a key meeting today between the Committee of Vice-Chancellors and Principals and Open University representatives.

The meeting will be the first of a series of regular liaison sessions between the CVCP and the Open University. It follows similar negotiations between the Council for National Academic Awards and the Open University about transfer procedures, which are now nearing completion.

SSRC grants itself £1m

Nearly £500,000 worth of current research grants has been awarded by the Social Science Research Council to itself.

An official answer to a question in the House of Lords by Lord Valley, minister of counties at Brunel University, showed that members of SSRC subject committees held grants worth about £300,000 from the SSRC. Members of the council itself had a further £110,000.

University grant cut by less than 4%

Mr. Williams, Secretary of State for Education and Science, was expected to announce the long-awaited universities grant for 1977-78 in a written answer in the Commons yesterday.

Although the figure was not available when THE TIMES went in press, it is known that the grant and the extra income received from the extra income tax will represent a cut of less than 4 per cent in real terms in support for universities.

Allen heads SRC

Professor Geoffrey Allen, professor of polymer science at Imperial College, London, is to be the next chairman of the Science Research Council. It is understood that he will take over from Sir Sam Edwards, who retires in October.

Industry has place for arts graduates' 'brain power'

by Frances Gibb

Arts graduates from Hull University last year did not realize that they could make a contribution to industry, the annual report of the Careers and Appointments Service says.

Only four out of the 268 arts graduates entered manufacturing. The report says: "Arts graduates simply fail to appreciate that their intelligence, analytical ability and powers of communication are just as important, perhaps more so, as a degree knowledge of a particular 'relevant' degree subject."

Based on the crude measure of A levels, the arts students had the highest level of "brain power" of any group of Hull students. British industry's problems would be overcome only by using the best brains. "Certainly a career in industry is not appropriate for every graduate, but we are disappointed that so few of our most able graduates give so little thought to the possibilities," the report says.

Despite the cuts in teacher training places, 34 per cent of all arts graduates went into teacher training. Many see teaching as the only field of work that offers a secure future and the percentage entering teaching was 2 per cent higher than the previous year.

Although there was still a shortage of teachers of arts subjects, notably English and languages, there could be no doubt that some of those completing training in 1977 would be unable to get jobs.

Generally, fewer graduates—5 per cent compared with 6 per cent the year before—were unemployed at the end of the year.

Among scientists, the mathematicians, chemists, physicists and electronic engineers had relatively few problems in finding jobs. A smaller proportion of graduates in these subjects, 19 per cent compared with 22 per cent the previous year, entered postgraduate training courses. Finding jobs was less easy for biologists and geologists.

Many economists had to make compromises, the report says, although most eventually found jobs. Posts in economic research were virtually unobtainable, but many were attracted into banking or accountancy.

One group of graduates who had particular difficulty in getting jobs was law graduates. The report says: "Further expansion of education courses in law could be a recipe for disaster unless the vast majority of LJB students can be persuaded to look for careers outside law, and there is little evidence that they wish to do so."

The report highlights the difficulties of certain groups of students—the handicapped, coloured immigrant, and mature graduates—in finding jobs. It attacks rigid recruitment policies that exclude older graduates, and urges companies to examine ways in which mature students could be assimilated.

The Civil Service, it suggests, might take a lead by dropping its upper age limit of 28 for applicants for executive officer posts.



The sixteenth-century Persian miniature, above, showing Indian war elephants being routed by cavalry during a battle between Alexander the Great and Porus, is one of the 10,000 Persian miniatures owned by the British Library. They form the basis of a new exhibition in the library's galleries at the British Museum, open until July 31, weekdays 10 to 5, Sundays 2.30 to 6. An exhibition of links in Manchuria, the language of the nomadic tribes who destroyed the Ming dynasty of China in 1644 and inaugurated the Ch'ing dynasty (1644-1911), is also on show at the museum, until June 30.

Experts who know more about less

by Sue Reil

Professor Arnold Kettle, professor of literature at the Open University, has strongly criticized the specialization in higher education, which is undesirable and self-defeating.

At the annual conference of the Association of Colleges in England, the Diploists in Higher Education in Birmingham last week argued for the development of interdisciplinary courses which are more objective and closer to the real world.

He told the conference: "The degree of specialization which characterizes the higher education system is undesirable, self-defeating, and it is a mystery to me why practitioners who see themselves as specialists know more and do less."

"These practitioners turn a subject into something dull, mystifying, and those who share its secrets and see its goals and deep dangers in it."

Professor Kettle warned that the specialization in higher education is self-defeating. He said that the specialization in higher education is self-defeating. He said that the specialization in higher education is self-defeating. He said that the specialization in higher education is self-defeating.

Falling population 'could put polytechnics at risk'

The polytechnics will be in jeopardy in an era of falling population unless they make a greater effort to establish themselves as different from the universities, a senior local authority educationist warned at the weekend.

Mrs Margaret Rees, chairman of the Inner London Education Authority's further and higher education subcommittee, said that unless the polytechnics could find new kinds of subjects to attract students, their future was uncertain. She said that the polytechnics must find new kinds of subjects to attract students, their future was uncertain. She said that the polytechnics must find new kinds of subjects to attract students, their future was uncertain.

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One over the eight

As a champion of the underdog, I now face in which no mention is made of either the Oxford or Cambridge crew. I shall instead concentrate on the reserve teams, Isis and Goldie, who, it seems to me, get a pretty raw deal.

Not for them television documentaries, nor press features, nor live broadcasts, nor free weekends in the Isle of Wight, nor swimming women. No, they have to find their own accommodation, eat as best they can, and then, on the day, row up the Thames while everyone asks who they are.

No one's mother flies over from America to watch them and no inter-club flickers in any commentator's voice. They are also rowed and, with the possible exception of Cheson's hum ride to Hades, there is no more certain aquatic route to oblivion.

Forget it

Romance is dead—official Time was young men crossed in love, went with expeditions to forget and came back purged with arduous of plant bugs and numeric puns; but not any more.

In July the Royal Geographical Society expedition to Mulu (Sarawak) sets off for 15 months and the society's president, Sir Donald Currie, takes a strictly scientific line. "The accumulated experience of a century and a half assures that expeditions have a practical purpose and that they are able to concentrate on the scientific ends for which they are planned."

Forty-two scientists are to spend months at a time here to produce a survey of the Gunung Mulu rain forest which is endangered by erosion.

At the launching session the team members also took a practical line. As they sat in the oaken hall of the Royal Geographical Society with the names of great Victorian explorers inscribed around the wall, they outlined the ecology of the district and the importance of protecting rain forests.

The only dash of old-style romance was the expedition leader, Robin Houbury-Tanso, an explorer who looks like Captain Mark Phillips and sounds like David Attenborough. He showed us slides and talked about "base camp" and "how to cope with moments of drama".

His eyes lit up when amid all the scientific talk, a colonial gentleman got up and asked him to give his regards to a very old friend in the Gunung Mulu National Park district. Probably someone he met while over there forgetting.

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Problem of post-school age group

Parliament, unlike nature, finds a vacuum eminently tolerable. The going role left in the Government's legislative programme by the suspension of the devolution debate provides MPs with either night and nothing or a greater opportunity for reflection.

For those like myself who entered the House after the first election of 1974, this month marks the conclusion of three years work since we emerged from the euphoria of electoral victory into the harsh reality of political responsibility during economic crisis. Perhaps the real government will also seize the opportunity to take stock of the situation in which it enters upon the second half of its parliamentary term as a minority administration.

Against this sombre background, I may prove useful to examine the Government's record in that area of education to which it has allocated priority, namely to post-school groups outside full-time higher education.

Not being of the school that believes that this particular Government should hold its light under a bushel, I begin by testifying to the advances which have been made. The quality of any educational system depends crucially on the ability of its teachers. Others have been linked together to maintain predominantly their traditional role in teacher education.

Present policy has been one of careful reallocation of resources operating against criteria which have been far from clear or consistent. Some colleges, having merged with polytechnics, are probably locked into a cross-subsidy upon degree level work. Others have been linked together to maintain predominantly their traditional role in teacher education.

For too many of the new institutions, however, appear to be blind in the increasingly complex maze of degree-level students. The Department and its local authorities could have defined a role for their future in very different terms. They should have been encouraged to develop a range of courses and to develop sub-degree-level work. This would have brought added breadth of opportunity to a student category which will clearly expand over the next few years.

Colleges have also increased student numbers with the tendency of a few students to prefer their environment to the school sixth form. In many respects this voluntary movement by a cohort of students fits in well with the Government's expressed intention of establishing a closer identity between the world of education and the world of work. Carefully even those students committed to the more standard A level courses are in institutions whose teaching staff frequently have wider career experience than their counterparts in the school.

Moreover, the student body itself reflects a heterogeneity which broadens perspectives with the mix of part-time and full-time, young and mature students. Although the question of courses and credentials to satisfy the diverse requirements of this age group presents a bewildering array of problems, the establishment of the Technical Education Council and the Business Education Council give some hopes of greater rationalization.

In adult education, however, the Government's banner looks considerably more threadbare. Repeated parliamentary challenges on the failure to make progress on implementing the Russell report tend to produce the single riposte of the success of the adult literacy programme. As one of those involved in the campaign from its 'body part'...

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Bookmaker (5)

My tips on how to write a university novel are almost complete. The only major character left is the absent-minded academic who in my novel will be called Jack Maybee and who holds the Brillo Pads professorship of mixed ability Egyptian.

To establish his absent-mindedness you can have a breakfast conversation with his wife like the following: "Where are your gloves, Jack?" "In the bank."

Stunned, she rises to telephone her best friend, Margot. "Jack has invested his gloves with the Midland Bank. . . . Yes, we're all surprised, Margot. . . . No, they're not valuable. They are woolly, with three fingers missing and daisies sewn across the knuckles."

In this way you can gradually have him distractedly invest his entire wardrobe and a neighbour's watering can until his absent-mindedness has been impressed upon the reader. You can then go on to the main section.

Recently there were a spate of asses in Oxford where kind-hearted dons were "conned" out of large sums of money by confidence tricksters, working in gangs, who claimed they had once met on holiday and had now fallen on hard times. Jack is a natural for this.

One night he answers the doorbell to find Don Connors and his 38 brothers crushed into the porch. "Hello," says Don. "Remember us? Isle of Wight 1932?" A half smile of uncertain recognition plays across the kindly Egyptian's face.

"If I were to say 'Shanklin's sea scotch where your wife swallowed two small rubber washers', would that help?"

Faced with this wealth of circumstantial detail, Jack turns and shouts to his wife. "Look who's here, darling. It's the boys."

"Who are they?" she barked. "Never heard of them?" "You must excuse my wife, she once worked in industry. He grows confidential. She worked for a firm that made Isomson sponge puddings and it has affected her priorities."

Eventually they can hint out of four Persian carpets and a package holiday in Tierra del Fuego. To give an axotic touch to your work (and get some foreign travel while they are filming it) you are advised to include a scene where the brothers are overrated dancing the tanga in 'Bio Bio' shopping precinct.

As I looked round the audience, I noticed that most of them were thinking the show was as bad as all that.

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Joint approach on safety is accepted by CVCP

The Committee of Vice Chancellors and Principals has agreed to set up a joint committee on safety which will include representatives of the Association of University Teachers and other unions concerned with university safety.

It will advise on matters connected with safety, and report to the CVCP. The AUT and the National Union of Students have been invited to name representatives, and the trade union side of the Universities' Committee for Non-Teaching Staffs is to supply 10 nominees from all other unions involved.

The AUT and the National Union of Students have been invited to name representatives, and the trade union side of the Universities' Committee for Non-Teaching Staffs is to supply 10 nominees from all other unions involved. The AUT representatives will be Dr Cecil Wood, of Birmingham University, and Mr John Akker, deputy general secretary.

The committee's first task will be to look at regulations on the question of safety representatives and safety committees coming into effect in October, 1978. In particular it will examine the role of guidance provided by the CVCP's own working group on safety under Dr John Birch, vice-chancellor of Salford University.

Mr Akker said the AUT had been pressing for representation on the vice-chancellor's safety committee for a year. "I regard this as a success. There is a very great need for a joint central coordination of training and advice on things which are of mutual concern to the trade unions and the universities."

Until now, the CVCP has resisted a joint central committee on the grounds that it would impinge on the autonomy of individual universities, he said.

The CVCP working group is currently planning a series of specialized handbooks on such topics as fire precautions, lasers, university workshops and laboratories as part of its code on the general principles of safety in universities.

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Ulster college intake cut

Speculation about the future of teacher education colleges in Northern Ireland increased last week after the disclosure that the Minister of State for Northern Ireland, Lord Metchett, intends to cut their intake to 700 next September.

The news was given to the Advisory Committee on the Supply and Training of Teachers, which had recommended an intake figure of 1,000. The figure of 700, which does not include entrants to Derry Technological College, or to colleges in Britain, compares with 1,373 last year and more than 1,900 in 1974.

Lord Metchett told a meeting of the advisory committee that priority had been given to the creation of employment over the past two years and that intake to the colleges must now be matched with wastage from the profession.

He admitted that there was uncertainty about wastage rates, but he had public announcements of the new intake level.

However, a paper prepared by the Department gave the current wastage rate as 3 per cent, consisting of 5 per cent wastage less 2 per cent re-employment. In the five most recent years, for which published figures are available, wastage rates ranged from 6.4 per cent to 7.9 per cent.

Tory 'task force' move

The Conservative Party is about to set up a working group of top academics, trade unionists, and business leaders to examine the relationship of engineering education to industry.

The group, which will be chaired by Professor John Thurston, professor of chemical engineering at Newcastle University, is the first of the "task forces" that are to be established as a result of the Tories' recent initiative to create links between Conservative policy makers and those engaged in research.

Dr Thurston, who is also a member of the Tory Party, was recently appointed as deputy liaison officer, with the job of visiting universities and polytechnics to find suitable academics.

The terms of reference and full membership of the engineering working group have yet to be announced, but the academics are: Dr John Birch, vice-chancellor of Salford University; Professor Norman Dudley, professor of engineering production at North East London University; Professor Boris Cole, professor of mechanical engineering at Leeds University; Dr George Broad, director of North East London University; Professor John Thurston, professor of chemical engineering at Newcastle University; Professor A. H. March, professor of engineering at Durham University; Professor Douglas Holder, professor of engineering science at Oxford University; and Professor A. W. Bright, professor of electronics at Southampton University.

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All Greek to me

There are more ancient Greek speakers in central London than you would imagine. Last week, audience packed into King's College to see the classical society's production of The Clouds by Aristophanes, performed in the original.

Although I had Greek at 16, something fairly serious has happened to it since. But I went along to see if the others fared no better. Of course, if you did not know Greek then what you would be watching was a drama about an old man in a sock driven mad by seven eccentric women who all talk at once. As if this were not bad enough, whenever his best friend (a nice old man in a hat) drops in for a quiet chat, the girls start singing and dancing and pointing at him—which would put a strain on any friendship.

To my amazement the audience roared with laughter. Admittedly, many of them were school parties, led by classics masters who got all the jokes and just about went at all the fun.

I showed more respect in the face of a classic than to laugh. But could not resist it when a schoolboy was hauled up on to the stage clutching copies of the original and the translation which he scanned in vain for a stage direction to account for his predicament.

However, back at the plot, the seven eccentric women were still singing to, and making life pretty intolerable for, the nice old man in a hat who had by now got some of his friends in to sort out these dames. The deputation was quite unexpected: one of the girls suddenly sings a large drawing of a chicken on the wall at which one of the nice old men's friends set fire to the building, a view with which we must have sympathy.

As I looked round the audience, I noticed that most of them were thinking the show was as bad as all that.

Dr Magnus Pyke is the retired secretary of the British Association for the Advancement of Science. If the extremist scientist has been unusually quiet on this and other

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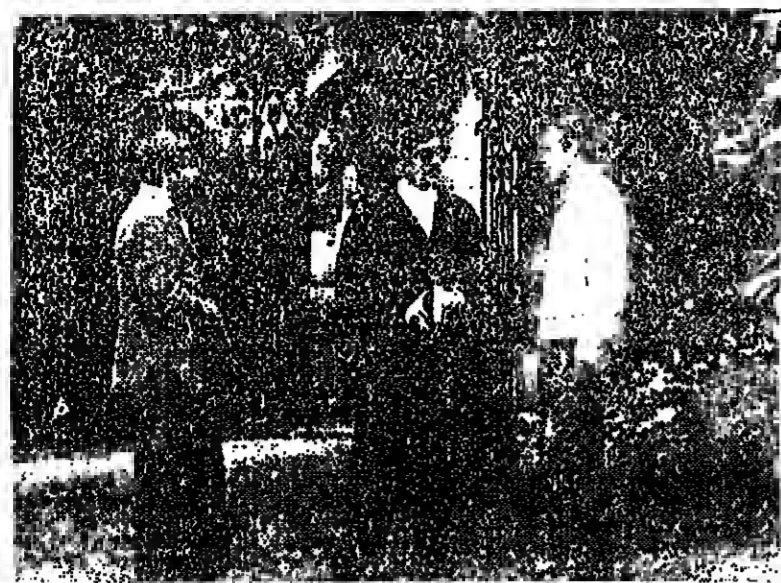
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Colleges keep tempo of change at slow, slow, oh, so slow



Tutorials, the cloistered calm of colleges, students on bicycles amid splendid architecture, are all part of Oxford University's 700 year tradition. But how has it coped with modern needs, and how well does it work as an educational establishment? PETER WILBY wrote this four-page report.

"The place engulfs you—it wraps itself around you rhetorically and architecturally. It resists change, but it also disposes change continually." That is how A. H. Helsey, Fellow of Nuffield College, describes the University of Oxford. The most striking surface characteristics of Oxford are conservatism and self-confidence.

At times the self-confidence becomes self-enclosed complacency. Oxford dons are not given to critical questioning of the underlying principles of higher education. If you ask about the value of Oxford's history, PPE or Greats courses, you are told there could be nothing much wrong with them because industry, the professions and, above all, the civil service continue to recruit the graduates.

It does not occur to anyone to inquire whether the post-war performance of any of the British civil service is satisfactory, and whether Oxford might not be able to provide it with more relevant skills.

Change is undeniably slow in Oxford. The existence of 35 separate colleges, inward-looking feudal villages, many of them doing back to the Middle Ages, not only obstructs change but also inhibits thought and initiative. In 1966, the Franks Commission proposed a Council of Colleges that could speak for them with a single voice. Instead, there is merely a Conference of Colleges that never prescribes anything remotely like a common view.

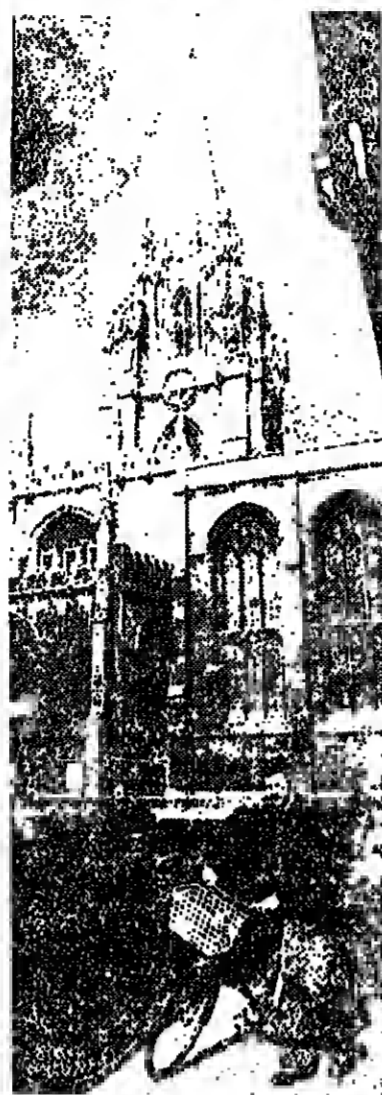
The college system retains its vitality because it can still obstruct and irritate and frustrate. To understand that is to understand why no new university in the world has been successful in copying it.

The bedrock of the colleges' power is their continuing control over undergraduate teaching and admissions. Almost all still try to cover almost all subjects. Proposals to concentrate the smaller subjects in a few have been only partially successful. In 1975-6 botany had 11 undergraduates in Pembroke and 10 in St Catherine's but another 17 were spread across 10 colleges. Agriculture had 15 of its 60 undergraduates in Keble but the rest were in 16 different colleges. Metallurgy, with 60 undergraduates in 11 colleges (45 in four of them) perhaps came nearest to concentration. And the larger the subject, the smaller the proportion concentrated in any one college. Out of the 918 historians no college had more than 50 in 1975-6.

It is not the subject matter of the college system that makes Oxford distinctive. When teaching is based on lectures it is a relatively simple matter to have a similar system based on another optional that was previously compulsory; one does not find fewer people in his lectures than before, the time will find more. But there is no similar flexibility in tutorial systems based on groups of one or two. If there is to be change, all the dogs must be involved in implementing it.

David Cauter, the former Fellow of All Souls, has observed that when changes in syllabuses are proposed, "the first reaction is to say 'no' and then to say 'yes'." It is a burden of "invisibility" of new subjects and disciplines and widening the range of universities progresses by consensus, but in Oxford the consensus has to be wider. Even a minority of 10 per cent can make a nuisance of itself.

The result is that many Oxford courses, particularly in the arts, appear archaic. Roman Law is still compulsory in the first two terms of the jurisprudence degree. Two out of six papers in English Literature prelims are on Anglo-Saxon. Theology degree structure is almost unchanged since 1923. One out of eight honours papers are on Biblical studies, and Greek is compulsory. The largest honours school in the university is still modern history. Last year, it had 284 final candidates out of the total 2,735 compared with 268 out of 1,308 in 1939. Its examination regulations open with the statement: "The examination in the School of Modern History shall always include the History of England. The 'History of England' means a continuous survey from Roman times to 1939.



Christ Church, Oxford.

able to marshal support among college fellows who had only the slight notion of the issues at stake. No generous description of Oxford's system of government is that it is "a total democracy with oligarchical aspects". Long-running is a major Oxford industry.

Yet, if Oxford is cautious about change, it may claim to implement change more effectively, once it is accepted. New courses are not set up only to wither away in the new universities. Who John honours schools have been set up in the past seven years. To repeat Halsey's observation, change is disguised as continuity.

Most outsiders would probably think that politics, philosophy and economics had been around for generations, so firmly does it seem absorbed into the Oxford structure and ethos. Yet it is scarcely more than 50 years old, and was originally headed as a controversial, revolutionary department in the Greats. Something similar is already happening to human sciences, which took six years of struggle to establish.

Again, Oxford has been slow to expand and absorb technology even in the wake of the Franks Commission's strictures on the subject. Yet, almost imperceptibly, it has become a more science-based university. The proportion of student scientists, 19 per cent before the war, is now 35 per cent. The chemistry school is the fourth largest in the university. (Before the Second World War, Greats, Law, Theology, Engineering and Metallurgy are no longer science buildings completed in Oxford were for these two subjects. Current plans are to increase the two schools' numbers by about one-third.)

This is not to deny that Oxford's science is probably purer and more academic than that of any other university in the country. Its engineering science degree is of the extreme theoretical variety (laboratory-based, that workshop-based) and polytechnics are always criticising. It is possible to take a first-class degree in engineering at Oxford without ever learning anything of welding.

One of the arguments deployed against the engineering science reforms (which would have put a

somewhat stronger emphasis on creative design) was that they would isolate engineering science from physical science. It is a firm historical belief that academic subjects must remain more closely attached to their intellectual roots than to their external applications.

Last year's report by the Commons select committee on science and technology about university-industry relations observed that only 2.2 per cent of the value of total research contracts with Oxford's science departments derive from industry and that "it would hardly be surprising if 98 per cent of the research carried out in these departments was of little relevance to industry". But Oxford, in its own steadily way and at a pace appropriate to a 700-year-old university, is setting about putting these things right.

There is a university-industry committee, which finds people who can meet requests from industry for specialist advice. Characteristically, Oxford, unlike some other universities, has not set up a formal framework but an essentially informal network which, though it started with a full-time secretary recruited from ICI, now relies upon the part-time services of a Registry officer.

There is a university centre for management and other activities that have expanded steadily over the past 11 years. It is currently planning to set up a teaching company for engineering science students. The centre's visiting staff includes Bill Weinstein, a Balliol physics tutor. Some four or five, Weinstein and a few other dons, visit the extra-curricular seminars at which dons and undergraduates could meet people from the business world.

The idea, says Weinstein, "was not to sell industry but to put over the reality. We got people to talk about actual cases, with a minimum of theory. The meetings were not formally advertised; the word was put round in the tutor's office. My wife is implementing something in the total environment that might have a more effect over a long period of time," said Weinstein.

Implementation... a modest effect... a long period of time. These are characteristics of both change and university life. It is rarely possible to identify, with any precision, the source of either. Appointments, for example, are normally joint university-college responsibilities (generally, the industry boys about one-third of the university's scientific staff, and about two-thirds of the scientific staff, naturally they have conflicting interests).

The faculty board leans to the candidate with the best academic record (while the subject, with its academic reputation may be more concerned with a candidate's qualities as a teacher and his or her willingness to take on college administrative responsibilities. The faculty may feel that the university as a whole is short of top-notch scientists, while one college already has a fellow who covers that area).

It is a delicate mechanism, in which each side can theoretically go ahead on its own but, in practice, will not do so because neither can afford to finance the appointment entirely from its own resources.

It is possible to speculate that the increasing influence of the faculties and sub-faculties, seeking appointments in the perspective of expanding "professionals" accounts for the declining incoherence of Oxford appointments.

At Worcester, for example, all but one of the 13 surviving fellows were elected before 1951 and Oxford graduates. Of the 21 elected subsequently, 15 took their first degree elsewhere, including one at Hull. And recent appointments to university chairs and readerships have been particularly notable for importing outside talent.

But, equally, it is possible to speculate that the college back-woodsmen (and, of course, it must be remembered that nearly every Oxford is formally a member of both a faculty and a college) now accept the equality or, at least, the comparability of other universities in a way they did not 20 years ago. Above all, the university's central

activity—undergraduate—is essentially unchanging. It is the tutorial and the essay are compulsory. The factors are the responsibility of individual tutors. Lectures, or the seminars, are held at all colleges and are coordinated with each other.

The tutorial, indeed, is Oxford's sine qua non. It is a unique feature of its life. It is a unique feature of its life. It is a unique feature of its life.

Andrew Glyn, economics tutor at Corpus Christi, said: "Tutorials on the same subject are awarded for the time it takes in an examination. You can't concentrate on that interest you and the student. You have everything."

Dons like Glyn argue, the Franks Commission, that the use of classes and lecture halls, the loss of "tutorial" sometimes threatens to erode the tutorial system. In fact, it has become increasingly essential.

Clark Broadin, senior lecturer in engineering and science, says: "The very able student, the marginal student, the average student, the important academically, the important in the process of view. He can get over the reality. We got people to talk about actual cases, with a minimum of theory. The meetings were not formally advertised; the word was put round in the tutor's office. My wife is implementing something in the total environment that might have a more effect over a long period of time," said Weinstein.

Secondly, an increasing number of colleges—and this year, for the first time, all colleges—have made "conditional" offers to a proportion of their candidates. These are offers of places, conditional upon the attainment of specified A level grades, and upon the same basis as all other British universities. Such candidates do not take an entrance examination.

Around 45 per cent of all the candidates accepted for next October have taken the pre-A level entry route. About 10 per cent of the total acceptances have received pre-A level offers. (On the expectations of previous years, about one quarter will fail to obtain the required grades.)

Most Oxford admissions tutors would describe the Oxford entrance examination—on, to a lesser extent, the A level examination—as a "handicap race". In other words, a lower level of attainment is expected from a student who attended an obscure northern comprehensive than from one who went to a famous public school. The justification, say the tutors, is that they are interested in potential rather than in attainment—exit standards are more important than entry standards. The problem is to determine precisely what the handicap should be.

"I don't like public school men," said one tutor. "They have to be good to get past me." Another admissions tutor said that his college might admit a comprehensive school candidate with 45 per cent in the entrance exam in preference to an independent school candidate with 70 per cent. Others, like Maurice Keon, of Balliol, will submit

The great 'handicap race' in the entrance stakes

A decade ago, the Franks Commission on Oxford University reported that "the admission procedures of Oxford are not in all respects satisfactory." They did not, said the commission, "completely meet the two great requirements laid on all universities of academic efficiency and social justice." Despite its cautious efforts, Oxford was "vulnerable to the suspicion of privilege and social injustice".

The three tables below show that Oxford has genuinely tried to meet these criticisms. But the relative lack of success in admitting a higher proportion of maintained school pupils raises the question of whether it has tried hard enough. Among men, despite dramatic changes in their origins during the 30 years before Franks, there has been very little change since the commission reported.

The chief reform in Oxford entry procedures over the past 10 years has been the expansion of the pre-A level entry routes. This was supposed to be to the advantage of maintained schools, many of which have no provision for a third year sixth form preparing students for a post-A level entrance examination. First, candidates were permitted to take entrance papers in their second year (or fourth term) of sixth-form studies. Arts and social science candidates take the same papers as the seventh term candidates (though they are marked more leniently), while natural scientists take a special paper.

There are, however, no differences in the rates of success for students in the large middle category of "good" A level results. And it is among the pre-A level candidates that the independent schools establish a device to offset the handicap. In total, overall, a higher success rate than the state schools. There is a unofficial but real independent school candidates (or, rather, schools with three-year sixth-forms) submitting candidates for conditional offers. But for conditional offer candidates is lower than for pre-A level candidates as a whole, this does not explain the discrepancy. Ironically, the pre-A level entry exam—originally created to benefit poorer state schools—now appears to favour the public schools.

scribing the idea of the handicap race, have a more cautious approach. "It is neither just nor kind to bring up people who will fail their prelims. The man who is a top boy at school all the time and comes here and finds himself in a competitive situation can be badly thrown. And there is no doubt in my mind that independent schools produce intelligent, educable people. They have proved themselves."

A student's first preference college is unable to offer him a scholarship, the candidate must then accept an offer from any college lower in his list of preferences that is prepared to offer him one. Only if they all fail to offer scholarships can he go back to his first preference college for an ordinary place.

The system is a delight to college tutors with a gambler's frame of mind, a source of irritation to others. An Oxford don once wrote that the students no more understand their real role in the scholarship system than did the horses at Ascot.

Abolition of the entrance exam and the scholarship system might make Oxford less daunting to maintained schools. And this would probably have more benefits than any system of more relaxed handicaps. Oxford's main admissions problem is still that it does not attract sufficient numbers of state school candidates. The maintained school, as Table 2 shows, is still inclined to believe that Oxford will take only candidates with the very highest A level results.

If Oxford could attract more men and women from state schools, even at the cost of lower entry standards, it would have little to fear. Whether it is desirable that academic talent should be more heavily concentrated in Oxford rather than in other universities is another matter.

Degree results over the past 10 years hardly suggest that the more flexible entry policy has lowered degree standards. Ten years ago, 73.5 per cent of the undergraduates passed the actual score as a percentage of the maximum possible score) was 59.9. Now, it is 66.1.

Past surveys (the latest was of the 1967 entry) have shown that state school students attain substantially better degree results than public school students. And the recent history of Hertford College has significant implications for the future of Oxford admissions.

Some years ago, the college deliberately decided to widen its entry net and look more to the North of England. It pioneered conditional offers in the face of opposition from other colleges, and later, it started making "unconditional" offers, in which pre-A level candidates are guaranteed places provided merely that they obtain two passes. Hertford, bottom of the Norrington Table as recently as 1971, has now soared to sixth place in each of the last two years.

In most colleges, tutors are probably still too reluctant to take risks. To meet the Franks requirements of "academic efficiency and social justice", Oxford could afford more discrimination in favour of the candidate with less impressive exam results.

But the chief obstacle to abolishing the entrance examination fits well with the Oxford system of personal college tutoring. Each college does its own marking of the entrance papers (except in mathematics), and tutors can have the papers in front of them as they talk to candidates.

Table Two Percentages of applicants and entrants from each type of school who have 'very good' A level results (11-13 plus). Post A-level entry for 1977

	Male applicants	Male entrants	Female applicants	Female entrants
Maintained	59	72	54	62
Independent	20	28	46	38
Direct Grant	21	74	65	66

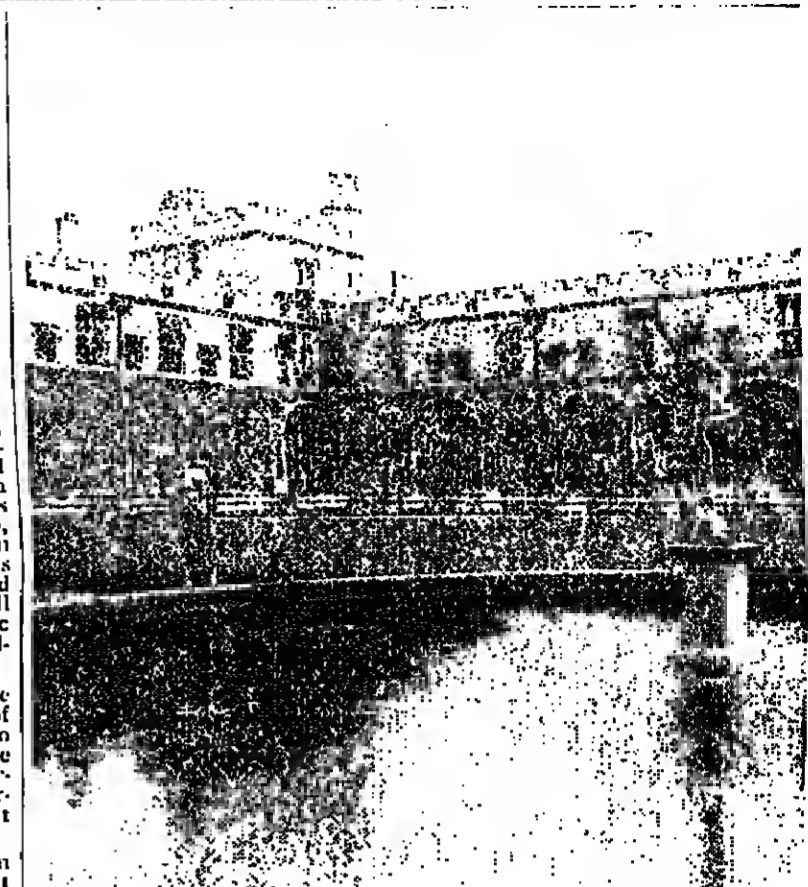
Table Three Percentage chances of acceptance for candidates from each type of school by category of A level results. Entry for 1977

	V. good (13-15 plus)	Good passes (12-13 plus)	Passes (11-12 plus)	Pre A level	All
Maintained men	97	43	14	41	46
Independent men	77	141	26	47	51
Maintained women	72	43	12	37	34
Independent women	72	43	12	37	48

Where the entrants come from

Type of school of men undergraduate entrants to Oxford. Percentages.	1939	1959	1966	1977
Maintained	19	30	40	44
Independent	62	53	41	37
Direct Grant	13	15	17	16

Type of school of women undergraduate entrants to Oxford. Percentages.	1939	1959	1966	1977
Maintained	33	37	43	52
Independent	51	37	31	25
Direct Grant	13	24	24	17



Christ Church, Oxford.

Poor get less poor but the rich stay rich

Oxford is more expensive than most other British universities. It finds some of the extra money from fees and university endowment income, but the charge per student head on public funds is still higher than average.

In 1974-75, the richest college (Christ Church) had a statutory endowment income of £653,454, while the poorest (St Catherine's) had £12,054. The statutory endowment income is calculated for the purpose of the college contributions scheme, set up on the recommendation of the Franks Commission. The scheme taxes the richer colleges and distributes the revenue to the poorer colleges as capital which to build up their endowments.

The poorer colleges are now on a more secure financial footing, but the contributions scheme has had only a minor effect on the inequalities between colleges. Christ Church still had £425,917 available for its own purposes even after paying its tax. And, with the richer colleges able to invest for capital growth and, in some cases, to exploit the land endowment booms of the past 10 years, the gap between the endowments of the rich and the poor may have increased.

How do the rich colleges spend their extra money? Some bursars say they reduce the cost to the public purse by charging lower fees. But, excluding All Souls and the postgraduate colleges, the difference in income from fees and the lowest fee income in 1974-75 was less than £150,000, and the differences between colleges of comparable size was even smaller.

Not is there much evidence that the richer colleges subsidize their undergraduates by board and lodging charges, even when the colleges choose to put under them is not. The famous Common Table, at which fellows may get free meals once or twice a day (depending on their college), sometimes with wine and meals for guests thrown in, is an example. It is up to individual colleges whether they include the costs of board and lodging in the fees. The £256,248 that was listed in the 1973-74 accounts under Common Table works out, on average, £150 and £200 per don. In cost-per-student terms, it amounts for £20.

Compared with other universities, Oxford spends no extra £160 per student on paying the salaries of its teaching and research staff (Oxford's dons are better paid than most), and an extra £93 on its libraries. The library money is explained by Oxford's more decentralized and diverse library system.

Other extra costs at Oxford are accounted for by the maintenance of older premises and administration of the college system.

But to concentrate on the differences between Oxford and other uni-

versities is to ignore the equally striking differences between the Oxford colleges themselves.

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الجامعة

The Royal Institute of Chemistry celebrates its centenary next week. L. H. W. Hallett describes the institute's continued interest in higher education

Keeping standards high in chemistry

In the 1870s the advance of chemical knowledge was gaining momentum in Britain, and was enabling chemistry as a technology to make a belated but decisive contribution to the Industrial Revolution. Chemists were needed as designers, research workers, analysts, plant managers and salesmen and their services were also in demand in the fields of public health, control of pollution and prevention of the adulteration of food.

There was, however, no institution outside the universities and major technical colleges that could protect the public from the chemical charlatan by defining a properly qualified chemist, or could serve the public by applying chemical knowledge as the engineers were served by the Institutions of Civil and Mechanical Engineers.

The Chemical Society, founded in 1841, was a learned society, and its members thought that professional matters were inconsistent with its charter, accordingly officers whom we should now call a "feasibility study" of the Institute of Chemistry of Great Britain and Ireland was constituted in 1877, and received its royal charter in 1884. (It was not until 1924 that it was granted the prefix "Royal" and its title shortened to the Royal Institute of Chemistry in a new royal charter granted in 1949.)

In the early years all the emphasis of sufficient distinction to serve on the council of the institute had to be public and either from industry or the public departments of universities. The first president, Professor Edward Frankland, for example, came from the Royal College of Chemistry and many of his successors, and members of the council, examiners and honorary officers have been (and still are) drawn from the professional ranks.

Thus from the beginning an interaction was established at a high level between academic and industrial chemists, and the institute; those chemists, and those who were members of the Chemical Society—found it possible to combine the advancement of knowledge and of its applications in the outside world with an active role in the government of the profession.

The most urgent problem facing the institute was the need to define what was meant by a qualified chemist, and to decide the criteria to be used in setting standards of education and training for chemists. This was a formidable task, but it was tackled with the energy and sense of purpose characteristic of the Victorian era.

It was decided that the final examinations for the associateship (the main membership grade, now renamed "membership") would be set by the institute itself. At first only practical examinations were set but within a very few years there were also papers at a high standard in theoretical chemistry. These bore a curious resemblance to final degree papers, which was hardly surprising since the examiners were usually university men.

Naturally there were those who thought that honours graduates in chemistry should be exempted from at least the theory papers, but the institute held the view that its own examinations were necessary to demonstrate the full professional competence of those who could pass them, and it was not until 1920 that the regulations were changed. Even then full exemption was restricted to those who obtained an approved first or second-class (second) honours degree from a recognized institution.

Further developments came from an unexpected direction. In 1920 the institute agreed to participate in forming a joint committee to administer the newly created National Certificate scheme, and once became involved with a wider spectrum of technical colleges.

Although Ordinary and Higher National Certificates were not formally connected with the institute's own qualifications—and indeed no exemption has ever been given for any part of the final examinations for success in an Ordinary or Higher National Certificate—it was inevitable that in the course of time more colleges would attain the standard of teaching and resources that would enable them to be recognized for training students to the associateship level.



"Theory and practical application": the timely motto on the Royal Institute of Chemistry's armorial bearings

nory or Higher National Certificate—it was inevitable that in the course of time more colleges would attain the standard of teaching and resources that would enable them to be recognized for training students to the associateship level.

In these developments the Institute played an important part, through its policy of periodic inspection and approval of colleges, in recognition in colleges to raise educational standards and in persuading local authorities to provide the necessary resources. A point was reached in 1957 when it was possible for five colleges, at Birmingham, Bristol, Hull, Liverpool and Salford, all of whom had an outstanding record in preparing candidates for associateship, to be placed in a "special relationship" to set their own examinations subject to moderation by the institute's examiners, and within limits to devise their own curricula.

The "special relationship" scheme was extended in 1968 and again in 1971, so that now all recognized colleges, organized into groups, set their own examinations; month-by-month three of the original five colleges

passed through the stage of colleges of advanced technology to become universities in their own right. From the beginning the institute had always insisted on the standard of a good United Kingdom honours membership (A1C and B1C (Fellowship) although no formal graduate professional experience was required.

There were those who objected that this was not consistent with the original idea of a professional chemist, especially since many universities were beginning to mention formal practical examinations at final degree level. In 1956 the regulations were changed to introduce a transitional grade of graduate membership, from which stage at least two years of approved experience were required to join the associateship. For this purpose both teaching and research in chemistry were accepted as approved experience.

At this time the gap between the original Higher National Certificate—which has thus become obsolete—particularly in the post-war years, and graduate membership had widened, so that a significant number

of students with the necessary qualifications felt disadvantaged by the backwardness of the latter. In response to requests from many sources, the Council of the Institute in 1962 introduced a new graduate ordinary degree in applied chemistry, to be awarded in one year of approved experience. This new grade of degree proved extremely popular (1,000 in 1963) and, among other things, it led to the interesting new course in applied chemistry, which was developed in 1968 and is now a very appropriate part of the institute's activities.

The institute has been successful in its resources. It has been able to improve its standards by allowing to it a deep interest in education at all levels, from school to postgraduate. However, resources have not increased in proportion to the growth of the Chemical Society and the Society for Applied Chemistry were merged to eventual completion, so that the cost of running the institute has increased and it is now employed.

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The growth of realism in student politics

Ralf Dahendorff's interesting and stimulating article in the *THES* (March 11) harks back, together with some aging student revolutionaries, to the heady days of 1968. He contrasted the optimism of the 1968 students with the essentially defensive and fearful response which he believes characterizes 1977.

This central thesis was illustrated both by reference to general social trends, and by alluding to some surface considerations, but he believes that this presentation contains some elements of truth, but fails to identify the most significant changes.

The size of the student movement has dramatically expanded. In 1968, the National Union of Students had 366,000 full-time student members. Eight years later, in 1976, there had been an 82 per cent increase in size to 668,000. Over the same period, part-time student membership increased from 1,311 to 169,740.

Significantly also, the proportion of full-time university students in membership dropped from 44 per cent to 37 per cent in the same period. This expansion has come from a number of sources, including the merger with the Scottish Union of Students, and from significant increases in union membership among further education colleges. The overall impact of these changes has been enormous.

Most important, the aspirations of students have changed. No longer can the average student assume that he will get a job in higher technical, administrative or managerial professions. Expectations have changed and with that the student movement as a whole has become bound closer together.

A parallel development has been the growth of trade union organization among white-collar workers (notably NALGO, BASS, ASTMS, AIT and the civil service unions), and the closer relationship of these unions to the TUC.

An ideological identification with the working class which is supposed to identify the student community with the labour movement is a whole. Expressions of this identification of interests were widespread during the 1970-74 Conservative Government. Students sought to give concrete support to industrial actions against government policies, the most significant being the 1972 miners' strike.

Many students and trade unionists identified the Conservative Government's Industrial Relations Act, and Mrs Margaret Thatcher's consultative document upon student union autonomy, as attempts to weaken democratic organisations. This was the period when the growing identification of students with the labour movement and trade unions found its first tentative expression, in a way which had never before happened.

The past four or five years have seen increasing expression of this identification in organizational terms. Student unions have observer representation on most local trades councils, and have joined trades unions in joint union campus committees in most polytechnic and universities.

The public sector trade unions and the NUS, at both local and national levels, have acted jointly against public expenditure cuts; indeed the NUS was alone among student organizations in endorsing last Tuesday's national conference discussing means of acting more effectively against the cuts.

The disputes agreements between the NUS and certain other trades union organizing workers in the academic sector represent a move towards (but by no means yet an achievement of) a qualitatively different relationship between students and campus workers, particularly at the level of dispute resolution.

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Students: more, or less, political than 1968?

of students. It is a shift which is intensified by, though not dependent on, the unsteady economic situation. In addition to the issue of relations between students unions and trades unions, a second development is the changed position and status of the National Union of Students.

It is no coincidence that the level of student activity has increased dramatically between 1968 and 1977. The number of student unions in dispute has increased from a very optimistic 30 (including the historic Hornsey and Guildford art colleges) to over 150 in the teacher education sector alone, and in unemployment (which over 120 were at one stage simultaneously in occupation).

This comparison reflects the fact that the NUS is able now to co-ordinate student actions throughout the country in activity against national government decisions. It also reflects the willingness of students in all kinds of colleges to take action in a way which they would not have been prepared to do nine years ago.

The orientation of the NUS is also changing and it is being felt by many students, though not necessarily reflected in their policies. The previous years irrespective of the change of office.

The period of quiescence is now, however, coming to an end, as faith in the Labour government as an agent of any form of positive change has almost evaporated. I have no doubt that student activity will become more, rather than less, widespread, and students will not be prepared to sit back without a whimper as circumstances become still worse.

A marked feature, however, which will give concern to many is a generalized lack of faith in the society's democratic institutions. This is not a limited matter—it is widespread and deserves a good deal more attention. The problem facing the NUS and all the political groups within it is to ensure that the great strength of feeling can be directed towards positive change, the necessary changes which are so necessary.

The alternative, which has so far not yet arrived, is an anguished and dramatic frustration which will and has the potential to indicate the best way forward is the set of relations with the labour movement as a whole which have now been established.

Charles Clarke
The author is president of the National Union of Students.

The author is president of the National Union of Students.

A page open to all those who feel they have something of value to say on topics of interest and concern in higher and further education



Temporary promotion: a substitute for mobility

Academic mobility as we knew it in the 1960s is rapidly becoming a thing of the past. No longer is it always possible, even in North America, to follow the advice of an American friend to the academic careerist: "When in doubt, move". Despite the apparent abundance of jobs, the lecturer would be granted for a limited term only, or at least to the first instance.

The position would automatically fall vacant again after five or seven years and would again be thrown open to competition. The academic who had held it would have the option of competing for a second term and, if successful, would become eligible to compete for a higher grade, also of a limited term only.

If unsuccessful, or if he chose not to compete, he would return to that point on the lecturer's scale which he would have reached by then had he not been promoted. A definite incentive could be provided by making the promotion permanent at the end of the second or third term.

A system of this type could allow retention of the academic more widely within an institution than is possible at present, and it could go a long way towards assuaging the bitter feelings that are bound to arise in any organization where there is a large prospect of growth, and promotion for many become virtually a matter of "dead man's shoes".

It could also provide a greater number of incentives than the present inflexible system at no extra cost. Indeed, there could well be a hidden saving in the matter of superannuation costs as regular competition tended to favour the younger and more active faculty.

One method of preserving a degree of mobility has been tried already, but the results have not been happy. This is the practice of having the junior faculty contract for a limited term, but with the option of moving to a higher grade at the end of a few short years.

It is a practice which has been likened in the past to an academic sweatshop, but unfortunately it duplicates only the misery of the traditional sweatshop, not its efficiency, such as that was.

Another method, yet to be tried, endeavours to increase the mobility of outward academic mobility into the institution itself. Essentially this involves retaining the basic academic rank of lecturer as a

neutral position while making all other grades leading from the lecturership subject to a periodic review.

Initial promotion would continue to depend upon the same criteria as now, but promotion would no longer be for life. In each year positions above that of lecturer would be granted for a limited term only, or at least to the first instance.

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Medical education for the people

When, in 1975, Mozambique acquired full independence from Portugal, large numbers of the country's white settlers responded with an immediate and unqualified demonstration of their feelings about the new regime—they left.

Most returned to Portugal; others moved on to South Africa, Rhodesia or similar countries that seemed to offer a promise of the kind of colonial lifestyle to which they were accustomed. Among these emigrants was a significant proportion—the exact figure is still contested—of the staff of the country's only university.

Last month I asked one expatriate British lecturer, now working at Eduardo Mondlane University in the capital, Maputo, whether this had created enormous problems for those who chose to remain. It seems not. After all, I was told, most of the students left too.

Keen to turn adversity to advantage, the Mozambicans used the exodus as an opportunity to revive the university's objectives, and to start overhauling the curriculum. As Dr Carlos Marzago, director of the university medical school, sees it: "The changes went smoothly precisely because the reactionary teachers had already left. If they had remained, all defending their own corners, the change would have been impossible."

Dr Marzago is a slightly-built man with a galvanizing energy, a pronounced South African accent (incongruous for one in his position) and an unrestrained enthusiasm for the Mozambique and all its medical work. Now Mozambique by nationality, he took over as director of the medical school at the end of 1974. "I'm still very much the new boy here, but I've learnt so much in these two years and I'm still learning," he says.

Many of these changes, he says, are predictable, the reforms that might

links judged by the Portuguese to be "unutilized", a euphemism for civilised.

As many as 70 per cent of black Mozambicans had little or no access to doctors or medicine, and such services as the colonial government did provide appeared to be virtually an afterthought.

The new independent government, reversing the old priorities, has chosen to stress preventive medicine for all—vaccination, the elimination of malarial, better sanitation and so on—rather than curative medicine for the few. To continue with a course that produced graduates more fitted to work in Western Europe than in Africa would have been absurd.

The country had to start training doctors who saw their futures not in the profitable delights of a private practice in the capital, but in hard work and long hours at some poorly-equipped clinic up-country.

Until recently, teaching on community aid preventive medicine was limited to one series of lectures to the fourth year. In the future, says Dr Marzago, "community medicine will be a theme running through the entire course."

"Many of our ideas are still being developed, but it's clear we must teach our students more about the politics of medicine. For example, before we teach them about such things as the sociology of drugs—about prices and advertising techniques," he says.

The medical school's policy of learning while doing has practical as well as didactic advantages. Mozambique's ten million or so people have only about 250 doctors, and medical skill is therefore a valuable commodity.

Geoff Watts speaks to the director of Mozambique's single medical school



Dr Carlos Marzago, director of Maputo medical school

housemen. To Dr Marzago's tertiary clinic they carry out the initial examination, take the case history, and measure blood pressures—all before Dr Marzago himself sees the patient.

At the beginning of 1977 the medical school had 480 students and 18 lecturers; after independence the student body fell to 150 and the teaching staff new numbers just two. Consequently, most clinical teaching depends on the doctors of the Central Hospital who manage it as and when they can—ad hoc arrangements typical of many such in a country short of almost every skill there is.

In terms of space, if not of teaching staff, the medical school is still largely under-subscribed. The annual intake of students could be as high as 70 or 80 or even 100; in fact, last summer saw only 23 entrants.

The obstacle to expansion is shortage of young people with basic schooling, a privilege hitherto reserved for the whites. So far up a majority of the students are from the present white population. According to Dr Heider Marthins, Mozambique's minister of health, the final years of colonial rule poured the Portuguese Government pour-

ing more money into the medical school than into Portugal itself.

This public rebuke left the school with buildings, none of which had been built since the 1930s and which have only recently been repaired.

But, according to Dr Marzago, "publicly rebuked as we were, we weren't polished for six years. I don't think we've cleaned up our anatomy department, but bits of dissected bodies have been lying around since one cleared."

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End of the liberal myth?

In all the recent criticism of higher education's supposed neglect of productive industry, an important point has been overlooked. This is that liberal education, any rigorous academic course is a valid preparation for employment—including industrial employment.

Thus John Stuart Mill could declare: "Men may be competent lawyers without general (i.e. university) education, but it depends on general education to make them philosophic lawyers... capable of apprehending principles, instead of merely 'examining' their memory for details. And so of all other sciences." Charles Wilson has shown that, over the nineteenth century, only half of the students who entered higher education from a business background subsequently returned to it; more generally, the stark between the values of culture and commerce, reflecting social class divisions, is a familiar theme of modern social history.

This history undermines the old liberal education theory. There is only one problem: a great deal of present higher education is based upon it. If it has come to the end of the road, we are left with much thinking to do.

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NORTH AMERICAN NEWS
MICHAEL BINYON reports from Washington

Help needed to give more PhDs to minorities

American top research universities are urging the Government to do more to encourage minority students to go to graduate work. A plan for a series of federal grants to help minority students is now being discussed with the Department of Health, Education and Welfare, and the universities are confident it will be favourably received.

The plan has been developed by the Association of American Universities, which represents the leading research institutions in this country. It proposes two things: money to help universities recruit minority students more effectively by sending out special units to deal with minority students' problems and money for graduate fellowships to be awarded by universities to qualified minority students.

The aim is to increase the number of American and American Indians who enrol in PhD programmes. At the moment the proportion is very small. Among Blacks, postgraduate work is disproportionately concentrated in schools of education, and the numbers receiving doctorates in law, medicine, the physical sciences and other major fields is low.

Universities are constantly urged by the government to train more minority students in professional fields, and the programme is "affirmative action" special efforts to employ minority teachers in universities—depends on the existence of a pool of properly qualified minority PhD-holders in all disciplines.

The plan is in essence very simple, but it raises a number of difficulties. The most important is whether it would be legal. If fellowships were tenable only by designated minority groups, this would raise the question of reverse discrimination, and unfairness in other minority groups such as Jews and Orientals (though these are both well represented in PhD programmes).

This is a particularly important issue at the moment as the Supreme Court is due later this year to rule on whether special minority admission programmes at universities constitute reverse discrimination and are legal. The other difficulty is how such a programme should be administered.

A touch of charisma in Grosvenor Square

When Dr Kingman Brewster moves to Grosvenor Square as United States Ambassador in Britain, Yale University will lose a president who for some years has been one of the most forceful and successful in America. He is virtually the only major university president to have survived the turbulence of the student revolt in the 1960s.

At Yale he has been a charismatic figure since he assumed office in 1963. An international lawyer by training, he is outspoken, blunt and pragmatic. He faced difficulties head on, unlike many university presidents who were overwhelmed by the social and racial crisis on campus. Dr Brewster was very visible and active in meeting



Dr Brewster—former Yale to the Court of St James

groups of Blacks, and taking control of difficult situations.

This has also made him a number of enemies, particularly among rich and influential Yale alumni who believed he was too liberal. In recent years this has probably damaged Yale's ambitious fundraising campaign in which Dr Brewster has been deeply involved. He launched the largest financial campaign ever seen in America—\$370m. This is only well behind target, having received only \$180m and the campaign is due to end next December. Dr Brewster indicated some time ago that he thought it would be time for him to leave Yale once the campaign was properly launched. His critics say that it is his presence that is holding up the campaign.

On the other educational scene, Dr Brewster has established a reputation as a spirited civil libertarian, and a strong opponent of Government interference in academic matters. Though himself a liberal, he is politically independent, having once been a Republican.

He is a strong defender of private universities, but has also served on a number of national and regional education organizations, including a Government advisory committee on higher education, the American Council on Education, the National Education Center, the National Center for the American Academy of Arts and Sciences.

In recent years he has been less in the limelight, though he is now leading a campaign against Government control of higher education and he gave an important speech in Oregon last year saying Congress should not use its power of the purse to force universities to conform to its wishes—even though

Was killing of student deliberate?

from Patricia Clough

Bologna University, the oldest in Italy, has for the past two weeks been the theatre for a drama of major political importance to the country.

In the view of many students and the city's Communist administration, student frustration has been exploited in a deliberate attempt to discredit the Communists in their strongest area and to undermine democracy in Italy.

The shooting of a student, the subsequent violence and the police occupation of the university has been a great shock in one of the most tranquil and well-run cities in Italy. Student rebellion in Bologna has been a major factor, for example, in Rome and Milan and the crime and violence occurring in many parts of Italy are less serious here.

The peace was shattered on March 11 when police were unexpectedly called in—a grave and exceptional move for Italian university authorities—to deal with incidents between leaving students and colleagues from a Catholic student organization, the Liberazione.

Police charged on in the ensuing fray a final-year medical student, Francesco Lirio, was shot dead. Alleged eyewitnesses claim that police aimed deliberately at the students. A number of bullet holes in the wall nearby indicate that they aimed at body height and not into the air.

The narrow, colonnaded streets of the medieval university district soon became the scene of violence and destruction as students rioted in anger at the death of their colleague.

Small guerrilla groups started spraying and setting fire to shops, breaking windows and smashing cars, a gun shop was riddled for weeks.

Two days later, police and carabinieri moved into the university precincts and cordoned them off but skirmishes continued. Meanwhile, the bitterness had spread to Rome where a nationwide demonstration of some 50,000 students turned into guerrilla warfare with shooting and major destruction.

On Wednesday, March 16, the city authorities and political parties organized a mass demonstration of about 100,000 in the main square to condemn the violence and demand



Unaccustomed traffic on the streets of Bologna

that full light be thrown on the shooting incident. As the speeches blared out over the square, round the corner some 4,000 students quailed in the street chanting slogans, clapping rhythmically and raising clenched fists.

The students were particularly upset that the dead student's brother, Giovanni Lirio, had not been allowed to speak at the big demonstration. Mayor Renato Zingheri said later that it was largely because he did not want to condemn the violence, but it was also suspected that bitter attacks on the Christian Democrats in his speech would have been unacceptable to the Christian Democrat leaders on the platform.

In a sense the Communists had had to make a choice between the Christian Democrats and the student left-wing. The choice further embittered the students.

The students were demanding the withdrawal of the police from the university precincts and the reopening of some 100 schools who had been closed down on the grounds that they had been directed the insurrection.

They also wanted the dismissal of the city's police chief and prefect. To a person they were convinced that the shooting had been a deliberate attempt to provoke disorder and weaken democracy in Italy. They regarded it as significant that it had happened in Bologna, for 30 years solidly Communist.

There was strong disillusionment at the Communist Party support of the Christian Democrats, regarded as corrupt, and its failure to suppress the violence and demand

Quota system will stabilize admissions

from Mike Duckenfield

COPENHAGEN A quota system with between 20 per cent and 70 per cent of first-year places reserved for those applying with work experience is to be introduced in Denmark this autumn. Proposals presented by the Government to the Folketing's education committee also include a 2.2 per cent increase in admission to long-term full degree courses during the next academic year and the stabilization of admissions of 24,000 until 1980.

The new selection procedures and course intake limits will allow university committees made up of senior academics and the decision last June to restrict entry to all long-term courses.

It has been considered necessary to halt the massive and largely unplanned expansion of higher education during the past 16 years. This expansion has seen the proportion of 19-year-olds qualifying for higher studies increase to nearly three in 10, while university dropouts from degree studies taking between five and seven years have been estimated by the education ministry as high as 70 per cent in humanities and 50 per cent in social sciences.

At the same time innovations, such as the creation of university centres offering short-term courses on Roskilde and Aalborg, have led to a 50 per cent increase in higher education. Only about 1,000 first-year students were at the two centres. Restriction of entry to medicine faculties was introduced on a trial basis last year when admissions cut drastically from 1,400 to 850.

The quota system used is now to be applied for all faculties except teacher training and psychology. There will be three quotas: one for those applying directly on the basis of school-leaving marks from upper secondary institutions including the academic gymnasium and commercial schools; another for those applying with both marks and work experience; and a third for those without appropriate school marks but with foreign or special qualifications including mature students, 25 or older.

Boleske, he thought, was chosen because it was the traditional stronghold of the Communists so as to unnerve them and make them react violently. "It was a trap," he said. "But we did not fall into it. This demonstration against the violence was the biggest there has ever been in Bologna. It was a great success."

The greatest need will be for social workers and social sciences employees (up 24.3 per cent by 1990), psychologists (160 per cent), economists (109 per cent) and architects (103 per cent). On the other hand, demand for doctors (87 per cent), engineers (58 per cent), comprehensive school teachers (55 per cent), dentists and lawyers (51 per cent), surveyors (45 per cent) and journalists (35 per cent) will be low.

Though overall admissions on full degree courses will increase 2.2 per cent to 19,720 this autumn, intake at both the traditional universities will be cut drastically: at Copenhagen by 19 per cent and at Aarhus by 16.6 per cent. However, both these figures are well below the preliminary ones of 25 per cent planned last year (7/25, August 1976). To compensate, there will be considerable increases at newer institutions. Odense, the most favoured technocratic university founded in 1956, will have its intake increased 44.6 per cent, the newest of the two university centres, Aalborg, will get 75 per cent more first-year students and intake at other higher institutions will rise 11.1 per cent.

Fraud scandal in Alaska

Higher education in Alaska is in turmoil, the State University has a multi-million dollar cash deficit, the president has resigned and a state investigating committee is now trying to find out how the money was spent.

No firm amounts have been provided. A spokesman for the association thought any programme would need between \$5m and \$20m—the exact appropriation would have to be voted by Congress.

A similar proposal has just been made by the graduate deans council of 11 major Midwest universities which turned up the Committee on Institutional Cooperation.

In a recent statement they said: "It is our considered judgment that a competitive institutional grants programme for the purposes of providing student assistance and other support services should be the primary avenue for Federal support to increase minority participation in graduate education."

"We recognize that the environment at some institutions is conducive to the minority student's success and that minor institutions is not. Federal support targeted to those institutions with a positive track record in the recruitment and retention of minorities would exemplify sound national leadership."

Obviously such institutional grants would make it possible to evaluate the extent of an institution's commitment to affirmative action with respect to academic, financial and support services to minorities.

Move to limit recombinant DNA research

One week after the end of the forum on genetic research, the government has decided to limit legislation to limit recombinant DNA research.

A report has just been issued by the Federal Interagency Committee set up to investigate the issue, and this recommendation is being used as a basis for recombinant DNA legislation.

The secretary of the Department of Health, Mr Joseph Califano, on releasing the report, said: "I realize that legislation in this area will represent an important step in the control of genetic engineering. But the potential dangers of recombinant DNA techniques warrant such a step at this time."

Mr Califano said: "I believe that a measure is necessary to safeguard the public and to secure the continuation of basic research in this vital scientific area."

Last year, the National Institute of Health issued guidelines regulating any recombinant DNA research funded by the Federal Government. Till now these guidelines applied to private industry research not sponsored by the Government.

About the only point of contention at the recombinant DNA Academy of Sciences forum was that the guidelines should be more broadly applied.

Mr Califano said he was urging research in this field should proceed under the guidelines unless and until better understanding of the risks and benefits of recombinant DNA research is achieved.

The federal committee also said that the current demand for jobs in the field of genetic engineering would lead to a situation of "overproduction". The present surplus of young graduates is directly attributable to the spectacular expansion of university education in the 1960s. This

When a degree is a handicap

from Lynn George

AMSTERDAM A 34-year-old unemployed sociologist working as a shiftworker at one of Holland's largest electronics companies was denied a job for failing to admit on his application form that he had been at university.

Although an extreme case, it is the less true that it is becoming increasingly difficult for the generation of graduates to find suitable jobs, with the resulting trend that some of them are accepting work below their academic level.

For a young academic emerging from the somewhat electrical sciences of a Dutch university with an eight-year, highly specialized study behind him, it must be his mind-bogglingly hard to discover that he was in a position to do so.

Until the beginning of the 1970s, graduates were placed on the labour market with relatively few problems. Since then the number of suitable jobs has not kept pace with the sharp growth in available graduate manpower. Not that the former is considered desirable.

According to the Bureau of Labour Statistics, there are now 3,600 graduates unemployed. This is slightly lower than the 1975 figure of 3,700 and represents 4 per cent of all academics.

Mr Van Esbroeck, director of the bureau, predicts that the percentage of unemployed graduates will rise to 5.2 per cent by the end of 1977. Those in the technical sciences constitute the largest group of unemployed (620 without jobs) followed by the social sciences (439), law (408), natural sciences (326) and psychology (321). (The order remains unchanged from last year.)

The future outlook for graduates appears even gloomier. According to a 1975 government document, "Development Trends for the Supply and Demand of Academics until 1990" compiled by the Ministry of Education and the Bureau of Statistics, the number of academics on the labour market is expected to grow from 160,000 in 1980 to about 300,000 in 1990.

If one takes present university policy, average trends in study choices and work expectations of graduates measured by entry and position, then by 1990 this report predicts 40 per cent of the group will be looking for jobs.

Republic of Ireland Link-up goes ahead for two biggest medical schools

from John Hargan

DUBLIN Plans for giving one of the Irish Republic's oldest independent medical schools a new status as the recognized college of one of the Dublin universities are close to being finalized.

The medical faculty in University College, Dublin, will be considering a request from the Royal College of Surgeons in Ireland for recognition of its courses and its teachers. The RCSI requests recognition to be given to the UCD graduates, the first of all referred by UCD to the Senate of the National University of Ireland, and has now gone from the Senate down to the medical faculty.

It will return to the NTU Senate, where a final decision will be made by the UCD academic council and governing body, each of which will consider the medical faculty report in turn.

The new move would link the two biggest schools—the UCD, RCSI is the next biggest—in a move directly related to the recent series of government decisions that the award of degrees should be confined to the universities.

Dissident for California

Dr Mikhail Shtern, the Soviet endocrinologist released from a labour camp last week, has been invited to lecture in California. The invitation by the University of California at San Francisco was issued while he was still serving an eight-year sentence, and this may well have been instrumental in obtaining his release.

Dr Shtern was head of the polyclinic Department of the Vinitsna provincial endocrinology dispensary until 1974, and made a reputation for treating sexual underdevelopment with hormones. He was arrested after his two sons applied to emigrate to Israel and was charged with taking bribes, gifts and relatives, and selling medication.

A vigorous campaign for his release was organized by scientists who had met him in the United States. In January, 97 prominent scientists

Help those who fail to get good enough marks to apply directly to university in the first year

The 70-20-10 ratio between quotas for the natural sciences and veterinary medicine, for example, stresses direct entry more than the 50-20-30 ratio for humanities and social science. While the 50-40-10 ratio for medicine and dentistry puts more weight on work experience.

Four admission to the technology faculties, work experience must be judged relevant to future studies and have covered 18 months.

Unlike the other faculties, teacher training and psychology will adopt a points system for entry. Four-fifths of places will be allocated in this way with the remainder, like for the third quota or the other faculties, being reserved for individual assessment.

AMSTERDAM

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"When we reflect on the serious, although relatively minor, problems that were provoked by the industrial exploitation of coal and electricity, when we reflect that after 150 years these problems are still not satisfactorily resolved, we are entitled to ask whether there are any solutions to the infinitely more complex hows of the next 40 years."

The problems involved in adjusting our social institutions to technological and economic change are indeed formidable. Among the tasks we face in the next decade or so are the following:

- Adjustment of the educational system to the requirements of new jobs and a new balance between work and leisure.
- Development of new criteria for measurement of national progress towards "quality of life" objectives.
- Development of improved systems for the management and control of public sector organizations and other institutions in the non-profit-making field, including educational organizations.
- Identification of adequate means of motivating people to contribute towards societal objectives, given the weakening of traditional incentives.
- Development of politically acceptable means of transferring incomes from producers to non-producers, and from affluent to less affluent regions.
- The working out of a new system of international trade, particularly in relation to the developing countries, based on recognition of the absolute requirement to export technology and employment rather than manufactures.
- Creation of participative managing systems that actually combine effective management with participation.
- Above all these is the problem of changing attitudes, particularly in Britain.

If we are to develop adaptive social institutions so as to respond in rapid technological and economic change and avoid catastrophic breakdowns of the social order, we must learn how to improve our skills in the fields of planning and social engineering. This will not be easy; if we are to succeed, three conditions must be met.

First, the identification and analysis of the social consequences of technological change must proceed dispassionately, objectively, and as scientifically as possible. Certainly, it must be freed from undue pressure from political sources or from vested interests or pressure groups of various kinds. There exists an urgent need for the creation of independent institutions of research capable of withstanding such pressures.

Second—and this would constitute a major task for such research institutions—there is a requirement for better models to work with.

Third, there needs to be an improvement in the way we approach the actual processes of managing change and conflict. Most attempts to bring about significant change in social institutions give rise to conflict. This reflects the virtually inevitable reactions of defensive groups of various kinds. There exists an urgent need for the creation of independent institutions of research capable of withstanding such pressures.

The constructive resolution of such conflict calls for skills of the highest order, yet the development of such skills is generally neglected. In particular, the almost universal absence of any training in the management of change as part of the formal education of technologists is worrying.

Finally, it is apparent that if these conditions are to be met there must occur in the future a closer integration between the disciplines of technology, economics and sociology than has been the practice in the past. This integration should begin at undergraduate level and continue into postgraduate and continuing education programmes. It should be recognized that the establishment of explicitly interdisciplinary research institutions.

It can be argued that it is in the longer term interests of institutions in higher education, acting together with industry and government to foster and support programmes of research concerned with the dynamic interaction of technological and economic progress with social factors. Already there is considerable support for such single-discipline studies as economic and technological forecasting. The time is now ripe to add a comparable level of effort in social forecasting, and to integrate the three into what, after all, has always constituted "the proper study of mankind."

The author is principal of Ashridge Management College, Berkhamstead.

Plants that make our society possible

by Ralph Riley

Crop plants provide most of the food used by man and his domestic animals and much of the fibre, rubber and pharmaceuticals. Without these plants the development and expansion, in size and complexity, of human societies would not have been possible. Yet the essential botanical underpinning of our societies is remarkably narrow.

Apart from decorative plants only about 500 plant species are cultivated, and the great bulk of the plant resources upon which we rely is provided by some three dozen or so species—the names of many of which will readily come to mind especially if you are reading this at the breakfast table or over your after-lunch coffee.

However, the mere cataloguing of the crop species currently used may give an unrealistic impression of fixity and continuity. The range of crops principally used in the 1970s does not correspond to that of the past and the future may well see further changes—depending upon the products required and the insight and inventiveness of crop scientists.

This is not to suggest that there will be substitutions for the major crops, such as rice, wheat, maize, sorghum, millet—on which civilizations have been built—nevertheless changes may be expected.

The introduction of new crops into agriculture and the disappearance of others is the backbone of history. For example, about 10,000 years ago the first agriculturalists made use of, and domesticated, primitive wheat species. The bread wheat species which is a dominant crop in current world agriculture probably arose in cultivation some 1,500 or so years later.

For some period afterwards the bread wheat species was cultivated together with its primitive relatives but subsequently, because of its greater productivity and usefulness, it largely replaced them. In addition, its better adaptation to extreme conditions permitted the expansion of agriculture into many continental and sub-tropical regions as well as into the temperate zones.

So the primitive species of wheat are no longer economically significant, but they have not been entirely abandoned from cultivation, as have other former crops. The common British weed Fat Hen (*Cheopodium album*) was formerly a crop. Analysis of the well preserved stomach contents of three Iron Age men—buried in a ritual casket in Danish peat bogs—has revealed that their last meals probably consisted of a stew in which the seeds of Fat Hen figured prominently together with those of flax and barley.

In Europe Fat Hen has for long ceased to be a crop but quinoa (*Cheopodium quinoa*)—a species in the same genus as Fat Hen—is still a staple grain in the highlands of Bolivia, Chile, Ecuador and Peru, as it was for the ancient Incas. Little plant breeding work has been carried out on quinoa but it is a crop which, following research inputs to improve yield and seed quality, might extend its geographical range since it has the advantage of high protein content.

About 30 per cent of the rubber used in the world derives from the rubber tree (*Ficus brasiliensis*) while the rest comes from the petiochemical industry. The economies of Malaysia, Indonesia, Thailand and Sri Lanka are critically dependent on *Hevea* rubber but until the beginning of the twentieth century the crop did not exist.

In 1876 the plant explorer H. A. Wicketham sent seeds of rubber to the Royal Botanic gardens at Kew where rather less than 3,000 seedlings were raised and sent principally to Sri Lanka but also to Malaysia and elsewhere. The natural rubber industry of the world is still based very largely on the descendants of these first introductions to agriculture.

A new and important crop became established in response to an industrial need, and the perceptible by-products and agriculturalists of low the need could be satisfied. Fortunately ecologically suitable land and the labour to work it was available.

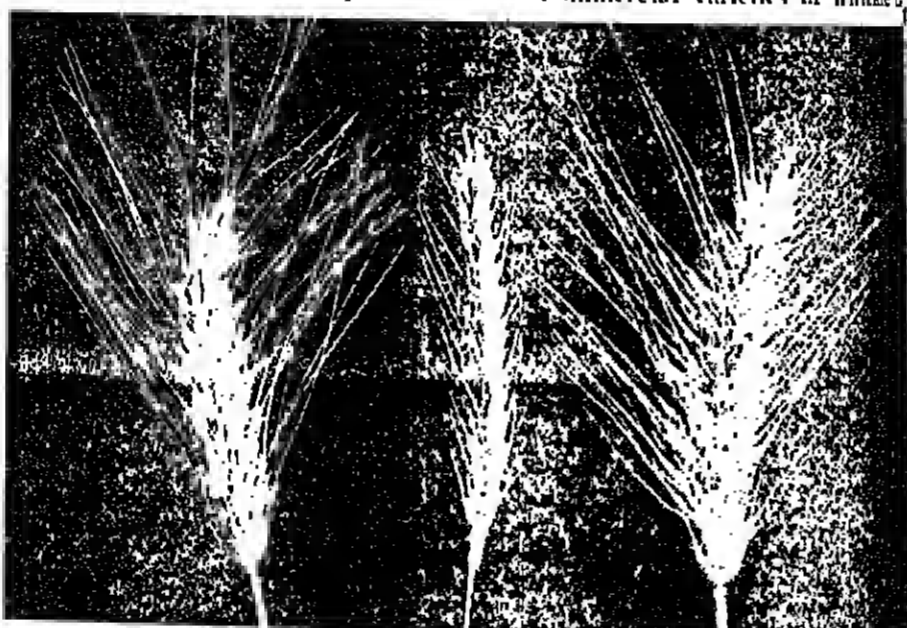
But consideration of rubber cannot end there. Most rubber now used consists of synthetic elastomers, but the petroleum from which it is made is an increasingly costly resource and moreover a resource that is not renewable. So rubber, a crop of the twentieth century, may well increase in importance and may indeed need to be supplemented.

The harvest of natural rubber could be increased by renewed interest in guayule (*Parthenium argentatum-Compositae*)—a long-lived shrub of the dry areas of North Mexico and South Western USA. It was cultivated for rubber production in the USA in the 1940s when there were no supplies of South East Asian *Hevea* rubber. The whole plant is harvested and about 20 per cent of its dry matter is rubber.

The only guayule now used is from natural stands in Mexico but with changing economic conditions, and improved processing methods and agricultural technology, it could become a significant crop of the future. Certainly it is reassuring to be able to contemplate renewable stockpiles of rubber being available from such highly contrasted ecological regions as the humid and semi-arid tropics.

Sugar did not become available in Europe until bulk trade opened with South and South East Asia. Before then sweetening had largely depended on honey. The large scale use of sugar awaited the colonization of the Americas and the establishment of sugar cane (*Saccharum officinalis*) plantations in the Caribbean.

Sugar beet (*Beta vulgaris*) is the alternative crop in cane for sugar production and now provides about 45 per cent of



Man-made crop: cereal ears of (left to right) macarumi wheat, rye, and chickpea

the world's supply. Until 1801, however, when the first beet-processing factory was established at Kunern in Silesia, *Beta vulgaris* was used only for cattle fodder or, as beetroot, for culinary purposes.

The British naval blockade of Europe prompted a series of decrees by Napoleon in 1811 requiring the study and cultivation of sugar beet. Selection was successfully practised for increased yield and sugar content of the roots until in the 170 or so years in which it has been grown as a specialist crop the sugar content of beet has been increased from about 6 per cent in the roots processed at Kunern to levels in excess of 17 per cent.

Over these 170 years an effective temperate-climate sugar producing crop has been established to supplement supplies from tropical cane plantations. However, there is increasing concern about the role that excess sugar intake may play in some human diseases and metabolic disorders and searches are being made for substitutes.

Sugar has three functions in food preparation but for the first two of these—bulk and texture—there are no obvious replacements. Most of all, however, we think of sugar as a sweetener and for this purpose several alternatives have been suggested.

Among the most promising of these are the fruits—the so-called sorghidiply berries—of the central African vine-like plant *Dioscoreophyllon dumosum*. These contain a protein called monellin, which has about 1,500 times the sweetness of cane sugar. Since it is the carbohydrate nature of sugar that causes problems in the diet of, for example, diabetics, the availability of a protein sweetener would provide considerable advantages. Investigations are at present under way

aimed at introducing the sweet berry into cultivation—so we are close to the birth of an entirely new protein monellin will find a wider than in medicinally defined diets.

So crop species decline in importance and are lost from cultivation or are tended by the addition of special care can be introduced through the selection of previously unknown species by plant breeders. An example of the latter is raphanobrassicca, following hybridization of the chromosome sets of raphanobrassicca and Brassica (*Brassicaceae*).

The derived forms, which are of considerable promise of success as crop producers at the Scottish Plant Breeding Station. In this instance a particularly range in the new crop lies in the variation of the different and complementary resistance to diseases inherited from each parental species.

Another example of an artificiallythesized crop species is triticale which combines the chromosome set of rye (*Secale cereale*). Triticale combines wheat in plant form and type but in some environments is robust and vigorous. It offers the ability of the cultivation of a grain similar to wheat, in marginal soils, which rye would otherwise be a better suited.

Commercial varieties of triticale

What makes this Rover a front runner

by David Bache

High-level engineering has long been associated with the Rover marque; the cars generally having a high degree of originality and thorough attention to detail in their design that made them peculiarly "British-engineered" in character. The new Rover 3500, with its radically different marketing emphasis, might to some eyes appear to be a complete break with the engineering traditions embodied by the Rover 2000 series, the three-litre and the many "P4" models before it. Yet on analysis it offers the same spirit of independent engineering thinking, the same response to changing requirements.

When development began the energy crisis was three years into the future, yet already there was a strong feeling that conservation of materials in manufacture, and conservation of fuel in use would be of ever-increasing significance. Likewise, although inflation was yet to suffer the rise which accompanied the Yom Kippur debacle, it was clear that extremely cost-effective design was necessary to enable the new car to be sold in a similar price bracket to its predecessors.

Also crucial to the concept of the bodyshell was the requirement for higher rates of production—the car was deliberately aimed at broadening the appeal of the Rover marque, particularly in export territories: current demand is even higher than expected.

Hence the previous "base unit" skeleton structure and bolt-on skin panels of the 2000 series car (which design had served its purpose well in a rather different era) was rejected in favour of a carefully designed monocoque structure. This gave more efficient use of sheet steel and thus controlled weight—a vital factor in fuel economy.

In addition, the reduced complexity of the all-welded construction eased the process of body assembly and its cost. As with most recent Leyland designs, the motor insurance repair centre at Thatcham were consulted during the body design period to ensure that the body would be easy to repair after minor accidents.

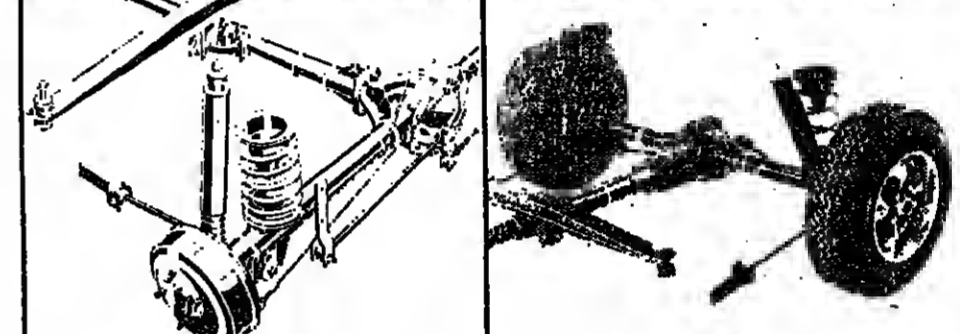
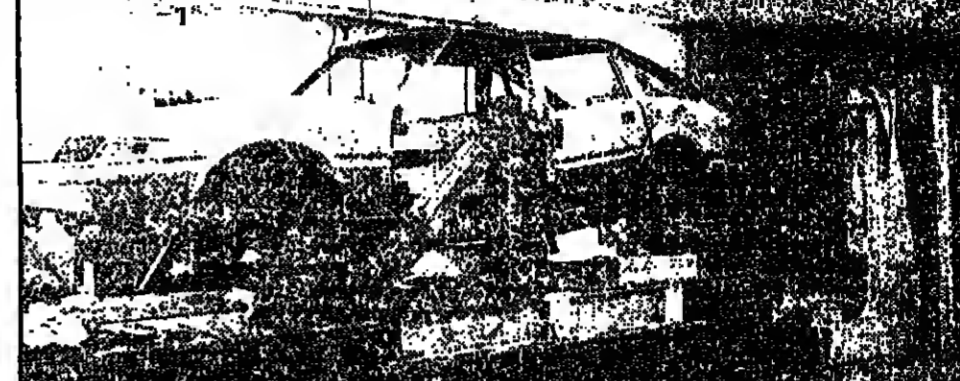
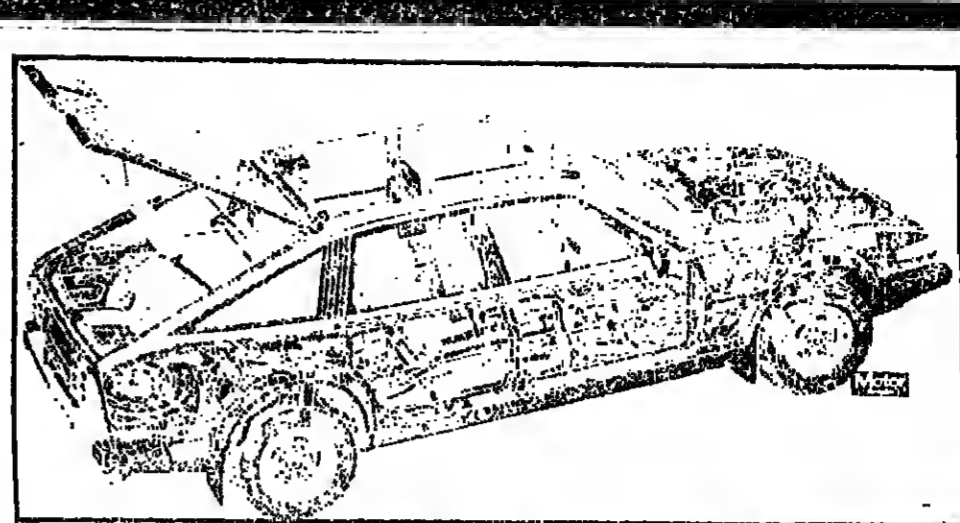
The styling team had a tough assignment in producing a shape which would fit the Rover image yet not the same time appeal in a much wider range of customers—particularly those with sporting tastes. A bold decision in 1976 was the adoption of the hatchback, semi-estate concept on a middle-class saloon car, when orthodox decreed a conventional boot.

The aerodynamic approach to body design, as typified by Citroën, had long been respected by Rover designers (the Rover 2000 would have had a lower nose profile but the cautious management of the time decided to retain a conventional air intake) and for this new model a low drag profile was evolved.

The air intake for engine cooling was combined with fog lamp mountings and transverse air dam in one large ABS moulding. By moulding this under-nose apron, it was possible to obtain the precise shaping of the air intake vanes required for good airflow and crisp appearance while, a further major advance was the corrosion-proof nature of what is normally a very vulnerable area of the body.

Early one-quarter scale models produced drag coefficients (Cx) as low as 0.32, and the final production vehicle has a Cx of about 0.39, complete with four mudflaps, large door mirrors and radio aerial. Most conventional saloons of similar size have drag coefficients of between 0.42 and 0.48. The fast back shape, which suits the fifth door configuration, also gives stability benefits, with a rearward centre of pressure—an important factor on a car which can reach 130 mph.

Impact safety is a major consideration in car body design today—legal requirements for various kinds of impact (barrier, pendulum, roll-over etc.) are becoming more stringent and widespread every year, so any new design must be laid down with an eye to the future. The Rover 3500



The Rover 3500. Top—under the skin. Middle—controlled cushioning of a bodyshell. Bottom right—rear suspension; and left—detail.

has the classic rigid passenger compartment with energy absorbent end structures system which is almost universal now.

An unusual feature, which derived from the Leyland ESV cars shown in 1974, is the use of longitudinal compression struts inside the doors, just below the glass line. These provide a solid load path on impact via small "proximity" pads located inside the door shut faces and on the door pillars, which contact each other after a small deformation.

The development of the correct crush characteristics for optimum energy dissipation on impact is a fast developing science. Sophisticated computer techniques have eliminated the old practice of using an over-generous safety factor and then using empirical tests. The high cost and time consumption involved in impact testing necessitates a "right first time" approach.

To this end, an early prototype bodyshell is placed on a crush rig and steadily crushed by hydraulic rams. Because the rig is controlled it is possible to analyse the deformation process in a way which would be impossible in a normal impact test.

The data obtained from various controlled crush tests is suitably adjusted from experience with actual impact tests, and can then be used in computer simulated impacts which will indicate areas requiring modification. Hence a bodyshell design may have undergone many simulated impacts before an example is finally committed to destruction against a real barrier.

One such barrier test carried out recently gave interesting results. Although no legal requirement exists for a one-third overlap impact into a rigid barrier at 30 mph, a Rover 3500 was subjected to this particularly severe test. Not only does all the energy have to be absorbed by one corner only of the nose structure, but in addition, if the impact is taken on the driver's side, the collapse characteristics of the steering column are tested to the full. To further aggravate the situation, the driver dummy in this test was left unrestrained, with no seat belt or air

On the American standard of 15 mph units (on which data is assumed to have occurred at 200 units), the driver registered 286 units, while the passenger

dummy, which was restrained by a belt, registered 19 units. This represents an unusually high level of protection, greatly assisted by the analytical techniques described above. For in safety engineering, there can be no simple approaches—an over-rigid structure can be more dangerous than a weak one.

There are other areas in the body design and tooling where the computer has made big strides. The Rover bodyshell has gained from considerable experience gained within Leyland over the past 10 years in the "smoothing" of panel shapes taken from original clay models, and the digitization of such shapes on to three dimension recording tapes which can then be used for the production of drawings and the machining of press tool dies. This accurate transfer of complex shapes not only ensures that the subtleties of style are carried through into production, but also helps to improve the quality of body assemblies.

It is perhaps in its mechanical design that the Rover points out the most significant engineering trends, particularly in rear suspension design, described in detail below.

A well proven power unit, the all-aluminium V-8 engine was improved in detail to raise its maximum rpm and give better breathing, with revised hydraulic tappets and electronic ignition, together with better cylinder head printing and exhaust manifold. Experimental work with better "HS" mid-engined sports car in the late 1960s had shown the power benefits of phasing the outlet pipes to give an extractor effect; this principle was used on the new exhaust manifolds, which have dual outlets each side with cylinders 1 + 5, 3 + 7, 4 + 6 and 6 + 8 linked.

In order to achieve the legally required control on exhaust emissions, the latest version of this engine is fitted with SU Hi-F type carburetors, which have automatic fuel temperature-viscosity compensation, while the air intake is temperature-controlled by the warm-up air temperature control (ATC) unit, which uses a very simple bi-metallic strip thermostat device to mix hot air from an exhaust manifold "oven" and cool ambient air. A four-barrier intake air temperature is important when using the lean air/fuel mixture necessitated by pollution regulations, and also assists fuel economy.

With electronic ignition, it was relatively easy to fit a diagnostic facility for checking timing and ignition performance a simple magnetic transducer senses crankshaft position of the front crankshaft pulley.

Again pursuing the ideas of maximum economy in materials and fuel, the five-speed gearbox fitted to manual versions of the Rover is in fact a corporate design which was conceived as a highly adaptable unit, capable of being fitted into a variety of models. The up-gear fifth-speed is overhung behind the main gearbox, which can readily be built in four-speed form if required. A construction exploiting high-volume, low-price taper roller bearings (identical to those widely used as wheel bearings) makes this gearbox particularly easy to assemble.

The gear clusters and selectors are all assembled onto a sandwich plate before hand, and this sub-assembly then slots straight into the main gearbox casing. Conventional gearboxes require a large access hole in the raising to allow assembly of the selectors in situ—the Leyland gearbox (designated by the spacing of the shaft centres, 77mm) has a considerably stiffer gear casing because no access hole is needed.

Another unusual feature is the provision of positive lubrication, via a small low-pressure pump in the various bearings: in particular the spigot bearing is protected during prolonged idling, as in warming up or traffic jams. By providing an up-gear 5th ratio of 2.83:1, exceptionally high gearing of 28.8 mph/1,000 rpm is achieved, which not only improves economy by a single reduction in engine speed, but also ensures that the engine operates predominantly under full torque and at maximum efficiency, using the lowest part of the specific fuel consumption curve.

It is in the rear suspension design that the most deceptively subtle engineering thinking and development have taken place. It was an exceptionally bold step to commit the design team to the achievement of high standards of ride and refinement with a live rear axle on a car of this type and price. By going back to first principles, a very original and rigorous design solution was worked out, which in fact is patented by the company.

The live axle has obvious advantages in terms of simplicity, durability and cost, but while good handling is relatively easy to achieve with careful location and damping, what is difficult is the combination of all these factors with good ride and vibration isolation.

A major factor in the success of the design is the provision of generous fore and aft compliance without compromising lateral location. This is done by allowing the front cross-member, which carries the location bracket for the nose of the torque tube "type differential housing, to swing on its mountings quite freely. However, virtually no lateral movement is allowed, and in conjunction with the rear Watt linkage, the axle is very precisely controlled to eliminate any significant "bump steer" effects.

Also important to the standard of comfort is the provision of large spring travel (23cm) with constant rate springs. With a large hatchback sprung of considerable load-carrying capacity (up to 550kg), the load-carrying ability for a soft ride could have led to sagging problems but these were avoided at relatively low cost and without any manufacturing, or service, complexities, by using Boge self-leveling damper units, which make use of the very suspension energy which they have to dissipate in order to maintain the car near to normal ride height, regardless of load.

These completely self-contained dampers were very carefully located in the lines joining the wheel centres and the torque tube nose pivot, thus ensuring that both bounce and roll modes of suspension movement would be equally controlled.

Implicit in this apparently simple suspension design was the requirement for a low floor-level to maximize the stowage area and also a safety location for the fuel tank, which is entirely ahead of the axle and partly beneath the rear seat, well away from impact deformation zones.

The torque tube principle assists with space saving, since the arc of swing is more compact than with a normal prop-shaft and live axle—and in addition, the geometry of such a layout gives anti-squat properties under acceleration torque input, and conversely, anti-dive torque under braking, both useful properties for a high-powered car like the Rover.

The author is director of styling in the product engineering division of Leyland Cars.

1550

ORACLE of change speaks on the screen

by Howard Steele

In recent years educationists have become increasingly chary of accepting at face value the claims made for the role of new technology in the classroom and elsewhere. In view of some claims made in the 1960s this is understandable—how it does pose problems when it is no longer a question of crying "wolf" or engaging in a "futurology" but of considering a major extension to broadcasting techniques that can be demonstrated here and now, and is already being transmitted daily as a pilot service.

Not very often—perhaps only once in several decades—does what began as a modest engineering research project show real promise of giving the public something completely new—a broadcasting facility that provides not sound, not television, but a means of broadcasting the written word and simple images in abundance, and largely free of the constraints of programme schedules: for such is teletext—or ORACLE as it is called by Independent Television and CEEFAX by the BBC. No other country has yet established a comparable service—though several are working towards this end.

Teletext, it is already clear, can provide a useful extension to broadcasting for the public at large—with the emphasis on news and information. But equally interesting, if still in an embryonic stage, are the possibilities it opens for socially-valuable services including optional captioning of television programmes for the hard-of-hearing and the provision of pro-

gramme-related material for education and instruction.

ORACLE and CEEFAX were first demonstrated in the spring of 1973 by the IBA and IBC. Independently developed they differed technically though providing similar services. By the autumn of the following year a joint technical specification, drawing on the original ideas of both systems but with increased capacity, had been agreed in conjunction with the British television industry.

Experimental services were initiated by the IBC and the IBA in September 1974 (with the independent television programme companies assuming responsibility for the ITV transmissions in 1975).

Perhaps too optimistically, the broadcasters had anticipated that the necessary special "decoding" equipment would become available from industry in sufficient quantities to provide a realistic assessment of the experimental services before they were due to conclude in September 1976.

For a variety of reasons this did not happen and it has only been very recently that such equipment is gradually becoming available to the public, although still in very limited quantities and at considerable cost.

As a result the trial period has been extended until July 1979 by which time it is hoped that not only will the news and information services have been more fully developed but also there will have been time to explore in more depth the programme-linked and public-service aspects of teletext—and for ITV further investigation will be made into the question of how such services could be made self-supporting (or partially so) by means of advertising or special service functions. More also needs to be determined on the economics of the system.

And by 1979, the related Post Office interactive system "Viewdata" will have been field-tested using about 1,000 receivers, and a decision made on the start of an official Post Office service. Viewdata provides more pages more quickly than the broadcast systems but incurs additional costs in the user through its use of the telephone system. It is confidently expected that Viewdata

receivers will be equally suitable for ORACLE and CEEFAX reception.

Broadcast teletext exploits the "wasted" time of a conventional television transmission—the blank periods between the individual pictures. Although every minute of picture transmission includes some 4.5 seconds of "wasted" time, although these seconds are split up into many short gaps.

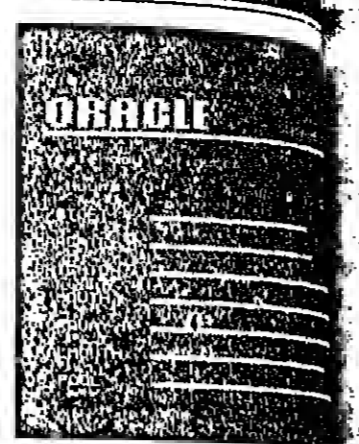
A very small part of this "wasted" time—just two "lines" (each 6.35 millimths of a second duration) in each television "field" are sufficient, with modern technology, to provide a means of transmitting bursts of very high speed data signals.

It is all rather as though after every time the picture is traced out on your screen, a burst of high-speed Morse is sent, but at speeds vastly in excess of anything ever contemplated by the pioneers of telegraphy. Whereas a manual telegraphist achieves perhaps 20-30 words per minute, transmitting continuously, the teletext information goes out at an average of around 50,000 words per minute, and the actual transmission rate during the "burst" of data is far higher than this. If the height of a television picture is reduced, the data can be seen as twinkling dots on two "spare" lines at the top of the picture.

At the receiving end the incoming data bursts are separated from the normal television picture signals and then any single "page" of information can be selected and fed into an electronic memory. This in turn provides information which reverts to the original message or simple still pictures for display on the screen. In effect it is a marriage of television and computer technologies with "telecommunications" wiring as best man.

This ability to "piggy-back" ORACLE information on an existing television transmission is one of the main attractions of the system to the broadcast engineer. He needs no additional transmitting stations, requires no more of the precious radio frequency spectrum, no new intercity links or distribution facilities.

For the broadcaster a teletext service can be established for a modest outlay



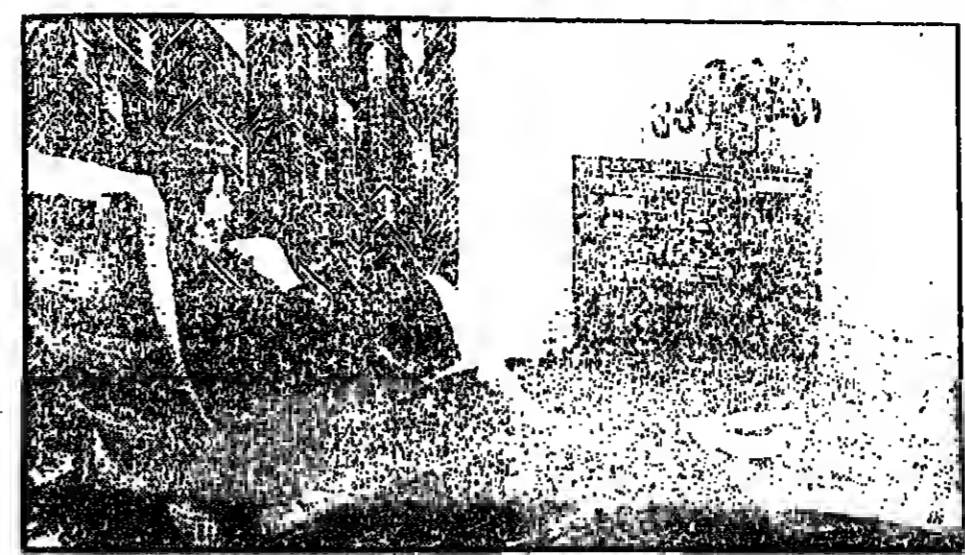
Above: An example of the information that would be sent to the viewer at home.

(by television standards) on the equipment and computer to set up the data signals at studio or regional centre and national costs in ensuring that the inter-network will not degrade the quality of the service.

This main cost is for the collecting, editing and sending of information. These account for about 10% of the total cost, for example, on the hours each day during which information pages are sent, and of course the scope of the service.

Any means of broadcasting a word has special appeal to the hard-of-hearing. It is being some 21 million people come in a general category in the United Kingdom. In the United States, some 10 million are estimated to be deaf or hard of hearing. More if material is directly related to normal television programmes or optional captioning; that is, by putting across the lower part of the picture which does not appear on the screens unless required.

As a result of experiments carried by the ITV companies, a specific for this has been incorporated



Below: An example of the teletext transmission standard.

into the revised signal is tuned from its digital form back into an analogue signal to be broadcast on the old-fashioned 405-line network.

In 1962 a new requirement entered the orbit of the television engineer. Possibilities with the launching of telecommunications satellites. We not only had the problem of the numbers of lines in each complete image scan—the Americans use 525—but because their public electricity supply operates at 60 Hertz instead of 50 Hertz, as in Europe, they have ten more television field scans per second.

The techniques developed for use in the standards converter from 625 lines to 405 lines could be extended to deal with differences in field scan rates as well. It will be obvious that for every picture element of the incoming picture there must be some moment when it would be appropriate to use its information on an entirely different television standard.

The technique is again to sample the incoming signal, store each element until it is required and then pass the signal into the output. The period for which each element has to be stored varies according to the position which it must occupy in the scanning raster of the new system and upon the relative (and unsynchronized) timings between the two scanning rasters.

Every element thus requires a different amount of storage but this can be predicted, given knowledge of the relative positions and timings. The field store standards converter operates by directing the incoming signal elements through electro-acoustic paths which delay their emergence until the appropriate instant. A hierarchy of delays with high-speed directing switches performs what one of its inventors, called "a Cassock Dance" to carry out the switching logic at very high speed and with precision. The delay paths are polygonal blocks of quartz, carefully temperature-controlled, in which the signals are caused to echo around until their exit is due.

The first all-electronic field-store standards converter was demonstrated in August 1967 and an advanced version made its debut in time for the Olympic Games from Mexico City in October 1968, producing colour pictures on the

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Every element thus requires a different amount of storage but this can be predicted, given knowledge of the relative positions and timings. The field store standards converter operates by directing the incoming signal elements through electro-acoustic paths which delay their emergence until the appropriate instant. A hierarchy of delays with high-speed directing switches performs what one of its inventors, called "a Cassock Dance" to carry out the switching logic at very high speed and with precision. The delay paths are polygonal blocks of quartz, carefully temperature-controlled, in which the signals are caused to echo around until their exit is due.

The first all-electronic field-store standards converter was demonstrated in August 1967 and an advanced version made its debut in time for the Olympic Games from Mexico City in October 1968, producing colour pictures on the

teletext transmission standard: "double height characters" which will considerably aid the viewer in reading the changing captions.

The broadcasters have had to be careful not to raise the hopes of the hard-of-hearing too high. There is at present no regular transmission of teletext captioning, and it is recognized that the cost of preparing captions in terms of man-hours per programme-hour is at present appreciable. The cost of decoders is also still high.

Much interest has been aroused by work at the University of Southampton and, in the United States, by the Public Broadcasting Service, on techniques which might considerably reduce the cost of providing captioning; for example by using the Palantype court reporting system, possibly with phonetic spelling of captions.

To probe educational applications a limited number of experiments have been carried out on ORACLE, although the virtual non-availability of teletext decoders in schools has inhibited this work. For example a teletext "multipage" that is, a page bearing a specific page number but with the contents changing

automatically at fairly frequent intervals—could be used to provide "teacher's notes" synchronously with a normally transmitted schools programme.

Then, of course, the rapidity facility is of particular interest to classes of hard-of-hearing children—and there seems a possibility of using overlay text to adapt schools programmes in lower age groups or for remedial education. Again, the public teletext news and information service would clearly be useful in schools for extending the awareness and interest of children to current affairs.

The future scope of teletext is inevitably a question of numbers of users, and this in turn will be affected by and will itself affect the cost of the additional decoding circuitry needed in the receivers, or to adapt existing receivers. The rising costs of conventional publishing will increasingly make electronic broadcasting of the written word more attractive.

It is perhaps still too seldom appreciated outside of engineering circles that the development of micro-circuits has tipped the balance firmly towards far greater use of electronic communication techniques. As Professor W. Gosling has

Television 2

Into Europe without wobble

by James Redmond

Television crossed the sea for the first time in 1951, when a team of BBC engineers took one of their early 405-line black-and-white television outside broadcast units to Calais and viewers in southern England were able to see "live" to their own homes scenes that were usually only associated with overseas travel. The television signals were beamed by radio link back across the Channel to a receiving point near Folkestone and thence in two hops to London.

In the 26 years that have elapsed, international television has become commonplace and the whole world now expects to be able to participate by television whenever an event of international interest takes place anywhere on earth or for that matter in space.

The television industry has made a great deal of progress since then, but the international venture made imperative that we should be able to take the output of the French television service and relay it to viewers at home.

Here was the snag. French television used a different number of lines to scan the pictures, and British television receivers would not have recognized the alien impulses had we been able to coax them through the transmitter at Alexandra Palace. We would have to convert the French television images to suit the scanning rasters which British television sets had been designed to expect.

At that time there were several television technology standards in use in Europe. Some countries were already using the 625-line standard which, if it had been agreed, would eventually become a common standard for all Europe. In

Britain the BBC was using the 405-line system with which it started television broadcasting in 1936; while the French were currently using two different standards: 441 lines and the very ambitious 819-line system, side by side.

Par those countries which had started television after the 625-line standard had been adopted, exchange of programme material from the technical point of view would merely require the provision of suitable international links but the problems of programme exchange between countries using different television standards had still to be solved.

Various workers had written theoretical papers on this subject, suggesting that conversion might be achieved by pictures on the original standard and viewing the display with another camera working on the new standard. The principle of "image transfer" standards conversion, as this came to be called, is very simple but the achievement of satisfactory results presented severe technical problems.

The fundamental difficulty is that, although a television picture may appear to be continuously present on the screen, it is made up of only one single very small bright spot travelling at a speed in excess of 7,000 miles an hour to write in the 405, 625 or 819 lines in one-twentieth of a second and then begin all over again. Persistence of vision in the human eye makes the scanning action of the electron beam appear to be continuous at all points.

The television industry did not offer a simple solution. It was suggested that a standard converter be used to convert from 405 to 625 lines in the scanning direction. It would thus be able to provide programme for the agreed international standard.

In 1962 the Pilkington Committee, set up by the Government to consider the future of television, recommended that Britain should begin a gradual change-over from 405 lines, which had served us well since 1936, to the 625-line standard which was becoming uniform throughout Europe and other places where the frequency of the public electricity supply was 50 Hertz.

The technical necessity to look the television image repetition rate to that of the present technology in television receiver design but option dictated no radical dis-

parity between the two. The standard two different television standards broadcast side by side in the same way would play a high premium on and trouble-free standards conversion.

The two early French systems carried entirely different picture standards which could be originated on the same standard appropriate to the system but the plan in Britain was to have the same programme on both systems. Hence we needed to have a camera in our studios operating at the standards with means for changing to the other for the benefit of those receivers worked only on the particular number of lines. Obviously television cameras should be set on the new and higher definition—625 lines—with conversion from 405 for transmission on the old work.

By 1963, BBC engineering department had developed an electronic standards converter, a complete departure from the transfer or "optical" system used. The techniques used in the converter included high-speed switching and sampling processes similar to those which were becoming familiar in speed computers. Some of the switches operated at a rate corresponding to 18 million rpm and the converter included 2,000 and 4,000 diodes—at that time an almost unheard-of number, to be included in apparatus.

Domestic standards conversion is a part of our everyday operation. It is not that it will be in these days the old 405-line networks for re-engineering in the 1980s, some 20 years after recommended they should be. Until then, we must continue to use 405-line images from the 625-line cameras on which our television sets will operate upon analogue signals. The incoming 625-line signals are sampled, marshalled into "quanta" and the information in each sample is then coded into a signal.

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the revised signal is tuned from its digital form back into an analogue signal to be broadcast on the old-fashioned 405-line network.

In 1962 a new requirement entered the orbit of the television engineer. Possibilities with the launching of telecommunications satellites. We not only had the problem of the numbers of lines in each complete image scan—the Americans use 525—but because their public electricity supply operates at 60 Hertz instead of 50 Hertz, as in Europe, they have ten more television field scans per second.

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pendent Broadcasting Authority and first went into service in November 1972.

This apparatus is also a regular service and performs the extremely complicated digital processes upon the signals that have been derived from satellite and coding the incoming analogue television signals. When it has rearranged the information to such a form that an image portrayed in the incoming signal is now at a new line-repetition rate, the signals are then retransmitted into analogue form for transmission as though they had been originated by the television camera on that particular standard. Transcoding between the different systems of colour, NTSC, PAL or SECAM, is carried out at the same time and by the same device.

It takes a very experienced engineer to originate, in a modern standards-converter picture, the small area that it was not originated on the standard being displayed. The expert watches for minor imperfections in the portrayal of motion through the scene is arrested, and portrayed at certain discrete intervals by the

original scanning process; it is displayed after conversion at different discrete intervals dictated by the scanning standard in which the pictures have been converted, and the perfection of interpolation required for satisfactory portrayal of motion is very hard to achieve. Modern converters are almost perfect.

In spite of standards converters and satellites, the international exchange of television programmes is still very much restricted by the problems of copyright, and language and time differences. Even in Europe, where the technical standards are often the same and time differences are small, exchanges are, to the main, restricted to programmes such as the Eurovision Song Contest and Jeux sans Frontières.

Language is not a problem in North America, but copyright and time differences, coupled with the problems of scheduling, have ensured that most entertainment programmes are still exchanged on film—a truly international standard. For similar reasons, the big productions for world-wide distribution, such as Age of Uncertainty, America, and The Ascent of Man, also use film.

But the combination of standards converters and satellites is a powerful one; standards converters permit programme exchange on any reliable standard and satellites permit immediacy. That use of both provides complete flexibility.

As a result, it is possible for the world "to be there" during great events such as the Olympic Games; and to receive news reports as quickly and as detailed as to the country of origin. Wars, and the methods of conducting them, are no longer private affairs and the effect of worldwide and immediate reporting on public opinion can be considerable. The comprehensive reporting of the Vietnam war is a good example.

The world is now a very small place in communication terms and we are much better informed because of it. The modern viewer, however, tends to take it all for granted and complains a little if the subtle colourings in an event taking place on the other side of the world are to the slightest degree less perfect than those from a local studio. It was a BBC engineer who, on the occasion of man's first landing on the moon, logged the picture quality as being "somewhat sub-standard".

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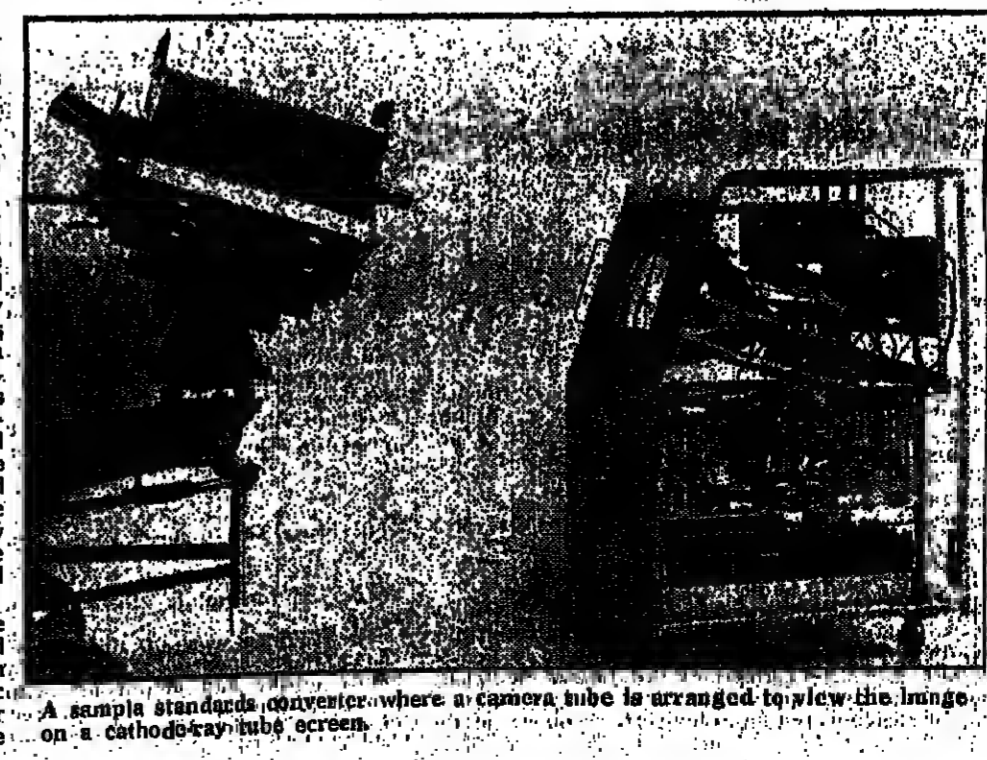
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البرق في الوطن



A sample standards converter where a camera tube is arranged to view the image on a cathode-ray tube screen.

What do you mean by 'sweetness'?

by K. J. Parker and A. J. Vlitos

While everyone would claim to know what is meant by sweetness, it is far from easy to arrive at a precise description. The perception of taste is an individual experience which does not readily lend itself to exact measurement. Without other an objective definition of the property of sweetness or means of quantifying its intensity the search for a valid relationship between sweetness and the chemical structure of a substance evoking the sensation is likely to remain unfruitful.

Nevertheless, interest in this difficult but challenging subject remains undimmed, spurred on by the demands of dietitians, physicians and soft-drink manufacturers for an acceptable harmless non-carbohydrate sweetener.

So far all known sweet substances have been discovered accidentally, there being no certain guide from the chemical structure that a compound will be sweet. The diversity of substances which are sweet ranges from such simple compounds as chloroform, salts of the metals beryllium and lead, through sugars and amino-acids to sulphonamides (which include saccharin and cyclamates), complex terpenoids and proteins. There appears to be no property or molecular feature common to all these substances which alone could be linked to sweetness.

The intensity and quality of sweetness does vary widely; the sweetest known substance being the protein, thaumatin, the sweetness of which, compared with a just detectably sweet solution of sucrose,

approaches 100,000. Sugar, more specifically, sucrose, traditionally becomes the standard with which other sweeteners are compared.

In such a comparison the characteristic flavour of other sweeteners shows significant differences, though these are not easily described. For example, the intensity of sweetness of glucose can be described as flat and harsh, of fructose thin and fruity, of xylitol cool, of saccharin bitter and of the protein monellin liquorice-like, though such impressions tend to be very subjective.

The variation in the quality of sweetness observed between sweeteners and between individuals suggests that the perception of sweetness is not a unique stimulus but there may be a spectrum of sweet responses. To understand how this might arise it is necessary to consider the more general mechanism of taste as currently understood.

The psychophysical approach to taste perception, which is concerned with the conscious impression of taste, differentiates four primary stimuli: sweet, bitter, salty and sour. All tastes are regarded as combinations of these four primary tastes, though, of course, the total flavour impression also includes tactile (for example, "mouth-feel") and olfactory stimuli.

The opposite school of thought classifies tastes as lying in a "multi-dimensional space continuum". This approach is less rigid and provides a simple means by which different perceptual attributes of flavour—for example, nuttiness, metallic, phenolic—can also be represented. Such a model is supported by direct experimental evidence from physiological studies on animals, though it does not follow that human taste experience is exactly parallel to that of a test animal.

During the past 35 years considerable progress has been made in understanding the mechanism by which the sensation of taste is conveyed to the brain. The tongue and palate are involved in justifiable perception, which is readily distinguishable from olfaction, or the sense of smell, though the two senses together provide an overall appreciation of flavour.

Taste is stimulated by saporins molecules in solution interacting with receptor sites on the surface of so-called taste buds which are grouped into clus-

ters known as papillae. Each receptor site is served by a single nerve fibre which transmits the stimulus as an electrical discharge to the brain, which can be detected and related to specific receptors. It is this means it can be shown that individual receptors are very sensitive to specific stimuli, of which the four primary taste qualities can be distinguished.

There is evidence to suggest that different receptors respond more strongly to specific sweet molecules and that these differences are genetically controlled. This is seen as variations in individual taste impressions and in the observed spread of assessments among members of a taste panel, which is, of course, selected to obtain close uniformity of taste perception.

Although it is convenient to represent taste sensation as a composite of four primary stimuli, analogous to the three primary colour standards of the visible spectrum in colour vision, there is little evidence in support of the analogous physiological mechanism.

Consequently, in seeking a relationship between sweetness and chemical structure, it is not necessary to accept the premise of a unique all-embracing molecular stimulus, though it would be satisfying to find this. Several receptor types, all of which transmit a signal interpreted as sweet, could exist, each being responsive to a particular molecular pattern in the sweetener.

Early attempts to relate chemical structure in sweetness attributed to certain molecular functions the property of exciting a sweet response. These were termed "glucophores" by analogy with the corresponding functional groups in coloured substances, termed chromophores, which absorb light strongly thereby imparting colour. By the same analogy it was proposed that secondary functional groups, corresponding to the auxochromes in light absorption, termed "auxochlores", are also necessary for the development of a sweet stimulus.

For example, the hydroxyl function alone does not elicit sweetness—alcohol is not sweet—but additional hydroxyl groups are associated with increasing sweetness, as in the sorbitol—glycol, glycerol, xylitol. But there are many exceptions to this simplistic approach: D-psicose, though with five hydroxyl groups is not sweet, while β -D-niamine, a sugar, is actually bitter. The delicate depend-

ence of sweetness on molecular structure is most dramatically illustrated by galactosucrose which is tasteless, only difference from sucrose being the hydroxyl group at position four of the pyranose ring of the glucose moiety.

Professor Robert Shallenberger of New York State University has advanced a most comprehensive hypothesis of a molecular basis of sweetness as a though further modification has proved necessary to encompass a wide range of sweet compounds.

According to his postulate the molecular structural criterion of sweetness can be represented by a dual coordinate AH...B system. A and B are electronegative atoms, with a spatial position such that the AH...B distance is almost exactly 0.3 nm. It is conjectured that this is complexed by a similar reorganization of atoms at the receptor, such that hydrogen bonds are established between the receptor's electric charge and triggering of nerve impulse.

The importance of a precise fit between the sweetener and the receptor is emphasized by comparing compounds differing only in the spatial disposition of functional groups. Amino acids of natural D-series frequently taste sweet whereas their mirror-image L-enantiomers are tasteless or bitter.

On the other hand, the series of carbon sugars, known as hexoses, are sweet in both the L and D-forms, but not necessarily equally sweet. This is explained by the dual character of a hydroxyl group which can function as a proton donor (AH) or proton acceptor (B). Hydroxyl groups are thus interchangeable, and the molecule can be a conformer having the necessary position of groups.

Amino acids do not have the opportunities as reducing sugars for imitigation, nor are the AH (NH)B (COO-) groups interchangeable. The importance of this freedom is seen in such molecularly constrained compounds as sucrose or the inositols: an essential hydroxyl group structurally out of alignment cannot be corrected by any other molecular conformation and sweetness is lost, as with galactosucrose and myoinositol.

This proposed mechanism is admirably simple and accounts

for washing, dry-cleaning, light and rubbing on both dyed and printed fabrics.

All these needs have been met—and more. A fairly recent technological breakthrough has been the technique of printing complicated designs or even pictures directly on a finished garment, by means of "hot pressing" a pre-printed paper.

This country, although not involved in the origination of the development, has taken a leading part in every aspect of the establishment and commercial exploitation of this latest aspect of colouration technology. During this development the expertise and flair of the British designers and colourists has played a considerable part. Reactive dyes, which can be chemically bound to the fibre, have novel developments of British origin in the late 1950s and of considerable impact in terms of brightness and fastness.

In the field of water and energy conservation, dyestuff manufacturers and particularly machinery builders have in the last few years made a significant contribution with the ever-increasing use of dyeing machines which use low-liquor ratio systems as well as recycling techniques for hot water and heat.

After fabrics have been dyed or printed the effects have to be assessed. We are witnessing the practical applications of colour physics to quality control in these areas, where previously the subjective of the human eye was the sole arbiter of shade matching and acceptability.

In particular Marks and Spencer is in the forefront of developments to introduce more objective instrumental colour-measurement techniques, utilizing a British built colourimeter and computer software. We believe this approach will have significant ramifications, not only in process and quality control of fabrics, but also in minimizing garments' rejection on account of poor colour consistency.

The changes which begin to take place in fibre, yarn and fabric manufacturing in the early 1960s heralded the growing involvement of the petro-chemical and allied industries, with their sophisticated engineering, planning and marketing,

25 years of development in textiles

by Trevor de Tute and Ismar Glasman

There is no doubt that technical developments which have taken place over the past 25 years in the UK textile industry have had a considerable social and economic impact on the consumer, not just in industry generally, but particularly in clothing, household textiles and in the leisure field.

In the late 1940s the natural fibres—cotton, wool, flax, jute and silk—dominated. Man-made fibres of that time were almost entirely restricted to regenerated cellulose (cellophane, viscose acetate and Cuprammonium (Bemberg rayon)). Together they accounted only for some 12 per cent of all fibres used. It is interesting to reflect that these developments were essentially empirical, since at that time little exact knowledge of the chemical structure of the cellulose molecule existed.

However, the developing science of X-ray crystallography was helping to establish links between chain building polymer structures and the science of fibre structures, especially wool. Consequently in the early 1940s in this country the application of this new-found knowledge was shown by the industrial production of nylon—one of the foundation stones of today's synthetic fibre industry. Although during the Second World War many industries suffered through raw material shortages and redirection of effort the new viscose rayon and nylon fibres actually benefited. High-tenacity

viscose rayon was superior to cotton for reinforcing synthetic rubber tyres and nylon filament yarns had properties that made them unique for parachute fabrics. Even then developments in the science and technology of textiles were seen to be one of the keys to future prosperity.

As already mentioned, the bulk of fibres in use at the end of the war were based upon natural raw materials which were in short supply and being imported, were not easy to acquire. The emergence of nylon as the textile scene in the late 1940s was followed rapidly by polyester, a totally British discovery. In the 1950s we saw the emergence of acrylic and polypropylene fibres with polyurethanes (elastomers) following in the early 1960s.

Not only did these new fibres produce novel fabrics in their own right, but they were also suitable for blending with natural fibres.

Initially, these fibres were only available in continuous filament form, but technology soon introduced a number of modifications which greatly enhanced their appeal. Ways were found to produce cut fibre versions so that they could be spun into staple yarns thereby emulating natural fibres more closely.

Bulk was introduced by texturing or crimping the fibres to develop more wool-like aesthetics, especially in acrylics. The growing range of yarns and fibre variants resulted in nothing short of a textile revolution by the early 1960s.

There are many examples which one could quote where fibre or yarn modifications have wide-ranging effects. The following represent only a few selected cases. The combined development of texturized nylon filament yarns together with the appropriate knitting machinery radically changed the ready-made underwear market; socks and stockings leading to pantyhose. Untextured or flat nylon yarn was found to be ideally suited to wavy knitting where machine innovations allowed the development of novel fabrics for lingerie and shirts.

None of these areas mentioned would have been capable of fulfilling customer needs to anything like the same extent without these synthetic fibres and the

innovative technology of the people involved, where fibre science and fabric technology were allied to fashion and consumer requirements.

In addition to the above technical achievements an important factor in the rapid success of synthetics was also their relative price stability, at least until the end of 1973, when world oil prices, on which most synthetic fibres depend for their raw material, were rapidly increased. Although prices in the early days were higher than for natural fibres, reflecting the initial high cost of research, development, manufacturing plant, marketing and sales, their price stability allowed a greater confidence in long-term planning production and sales commitments. Such stability is much more difficult to achieve with natural raw materials, depending as they do upon the vagaries of farming, agriculture and the weather.

Interestingly, the special characteristics of fabrics available from these new yarns—warmth with lightness, shrink resistance, drip-dry and crease resistance as well as hard-wearing properties—soon exposed the limitations of natural fibres, particularly their lack of easy-care characteristics. In their flight to remain competitive, in which they have been essentially successful, these fibres resist mechanical treatments were applied to cotton and rayon; permanent press finishes became polyesters and cotton fabrics. Fibres based on cellulose, cotton and rayons, as well as some synthetic fibres, for example acrylics, are not inherently flame retardant.

Therefore we have seen over the last 25 years a determined effort by fibre producers, helped by chemical manufacturers, to develop flame retardant fibres by both structural modification as well as by chemical treatments in celluloses. Such fibres, in fabric or garment forms, are now commercially available.

Recently, suitable costomers have opened up new ways of producing shrink-resistant wool, giving machine-washable garments in competition with existing

resin finishes. These elastomers are being further developed, especially in non-fibres, whose performance properties are much improved.

With every chemical finish, particularly for garments worn next to the skin, the possible health hazard is something for which the scientist must now make part of his overall assessment.

All of these systems are aimed at filling certain needs increasingly expected by the customer for easy-care garments, washed by sophisticated domestic machines which have eliminated many of the back-breaking washdays of yore, as well as the necessity for dyeing.

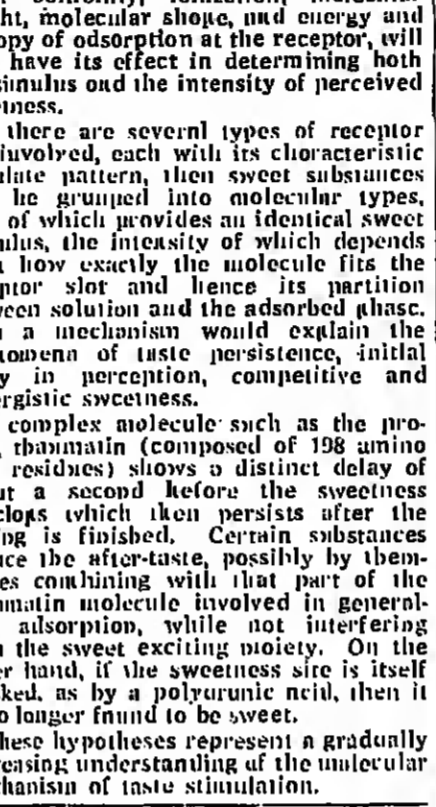
Usually it takes 25 years or more for fundamental discovery to reach large-scale industrial application. In the case of man-made fibres, this time has been much reduced. By 1960, they accounted for some 29 per cent of all textile fibres used in the United Kingdom and in 1975 this figure had risen to 39 per cent, which nylon held a large share. The phenomenal growth has continued, or less unaided, so that by 1975 usage of man-made fibres had reached 48 per cent of the total.

Despite the many advantages of these fibres outlined above, their wide existence alone could not have brought about such a rapid and widespread change. Without their efficient conversion to woven or knitted fabrics to which finishing and printing are applied, their parameters, as well as improved performance properties, their impact would have been greatly diluted.

Each new fibre, starting with regenerated celluloses, has needed dyestuffs, dyes and dyeing systems compared to wool and cotton. The impact of the dyestuff manufacturers, particularly with the engineering capabilities of the successful colouration of fibres, has been to ever better standards. These have been the result of the combined efforts of dyestuff, textile and finishing engineers, while the customer has benefited, quite rightly, better

How BR got back on the right track

by Sydney Jones



Experimental advanced passenger train at 125 mph with 8 per cent tilt round a curve.

Modern science has tended to find its earliest market outlets in the sophisticated "science-based" industries such as aeronautics and electronics: it is comparatively rare in see industrial applications on a substantial scale, due in part to long term lack of competition.

But when competition becomes explicit and threatening the response can sometimes be dramatic. The case of road versus rail networks is a case in point. It resulted in a vigorous manner and solving one of its formerly major problems—the inability to reach competitive speeds economically.

About 15 years ago the British Transport Commission decided to build a large research laboratory, costing over £1m, as the first step in developing a competitive technology. The present research laboratory of British Rail is now one of the best-equipped and best-staffed of its kind in the world.

In the early days it sought to identify urgent problems, and the highest priority was given to an examination of the dynamic interaction between wheel and rail, as it was evident that predominant among the various technical problems inhibiting the commercial development of railways was the inability to reach competitive speeds at an economic rate.

Railways throughout the world had been subject to competitive pressure for many decades, but no satisfactory solution to this problem had been found, primarily because of a fundamental problem that had long been recognized, namely instability. At relatively low speeds, rail vehicles followed the track smoothly; but as the speed increased, a point was reached at which, however smoothly the vehicle would break into an uncontrollable lateral oscillation, initially barely perceptible but becoming quite pronounced as the speed increased.

Essentially the phenomenon is dynamic instability of the kind arising in any guidance mechanism that employs a feedback system of control. In railways, guidance is provided by coning the treads of railway wheels, so that a pair of wheels fixed solidly to a common axle will follow a curve in the track by moving laterally until the effective diameters of the wheels on the two rails are sufficiently different.

When the pair of wheels meets a disturbance with the rail, it will oscillate laterally with a motion that, in a non-dissipative system, may be expected to diminish as an exponentially decaying wave motion, with a wavelength along the track depending only on the coning angle of the treads. The frequency is therefore proportional to the forward speed.

The lateral oscillations are set in motion by forces between the wheels and the rails; and as the speed and frequency rise, so do the forces, ultimately to a degree at which "creep" becomes important, the amplitude of the lateral movement increased, and energy is fed from the forward motion to the lateral oscillation. In extreme cases the lateral motion increases until limited by flange constraints; considerable forces can then come into play and there is a danger of the vehicle leaving the rails.

The problem, so simple to describe but so complex in reality, proved impossible to solve over many years. Only recently has research work in British Railways yielded success; to the degree that it is now possible to design railway vehicle suspension systems capable of stable speeds up to 300 kilometres an hour and running, in an economic manner, at beyond.

This success could not have been achieved without the employment of a mixed team of science-based engineers' with experience of both railway engineering and allied problems in other fields (notably aircraft vibration phenomena and closed-loop stability criteria), and equipped with large computing facilities and modern instrumentation.

The work, which was recognized with a McRobert Award in 1976, stimulated thinking about the optimum design of trains, and led both to the design of the bogies for the High Speed Train and to the concept of the Advanced Passenger Train (APT).

The High Speed Train represents the modern railway engineering practice which is based on a new bogie permitting train speeds of up to 125 mph (200 kph) to be achieved where track curvature is sufficiently gentle. The Advanced Passenger Train increases performance still further in a number of important respects for it allows:

- stable running up to speeds of 250 kph
- powered tilt of coaches to enable curves to be taken at speed

● economy of design concept, for example in the use of one bogie per coach and the articulation of coaches in such a manner that on a curve there is minimum encroachment outside the volume occupied on straight track;

- low aerodynamic drag and lightweight construction to reduce fuel consumption;
- low sprung mass to reduce pounding forces on the track;
- powerful braking to match the speed.

It is hoped that the phased introduction of these two trains into public use will meet future demand for high-speed rail travel up to the end of the present century. It is no exaggeration to say that for the first time in their history, railways are now able largely to satisfy the demand for comfortable high speed ground transport in an economic manner.

In addition to making trains run smoother, faster and more economically, other aspects of improvements in system performance are being pursued, notably signalling, on which the fullest use of the track heavily depends. Already the "two aspect" (stop go) semaphore signals have been widely replaced by the "four aspect" system of colored lights (four levels of caution, go, and the manual intervention of signals and points is rapidly giving way in remote electrical control, with the considerable saving of unattractive jolts that are difficult to fill.

A further development is the fact that the location and state of readiness of a vast fleet of freight wagons—information essential to efficient management—is now controlled through a data communications network coupled to a data store. And the "slab track", a form of railway construction in which the rails rest on a continuous slab of reinforced concrete or other suitable material, is in an advanced state of development.

One question that often arises is whether these developments are too late in the history of rail transport. One has only to compare the convenience and relative luxury of the modern motor car with the relative inconvenience and spartan of much train travel to have considerable doubts about the future of rail.

If the trends in forms of transport of the last few decades foreshadow the developments of the future, then one could find little hope for a general rail passenger—and hence freight—network. There are however, three very important factors which bear on the future pattern of events, namely:

- the technical developments already achieved put railways in a good competitive position and provide a springboard for further future developments;
- economy of fuel and materials of construction will become dominant considerations if the trend to the use of nuclear power grows as expected;
- growing resentment of pollution of all forms, noxious exhaust fumes, noise and visual intrusion, are becoming evident.

These considerations, taken together, lead to the belief that public rail transport will find more favour in the future than recent events would tend to indicate. Perhaps the greatest obstacle to such a change might be the failure of decision-makers fully to appreciate the changing opportunities becoming available; together with the sheer momentum of current events and that unbridled logic of self-destruction: "More cars, more roads; more roads, more cars."

Once this present trend is checked, a cumulative movement in a more desirable direction could quickly be established. As railways are a fixed-track system with considerable investment in the track, they are said to be "volume-hungry"—in other words the investment in the track can only be justified if it is used by sufficient revenue-earning traffic.

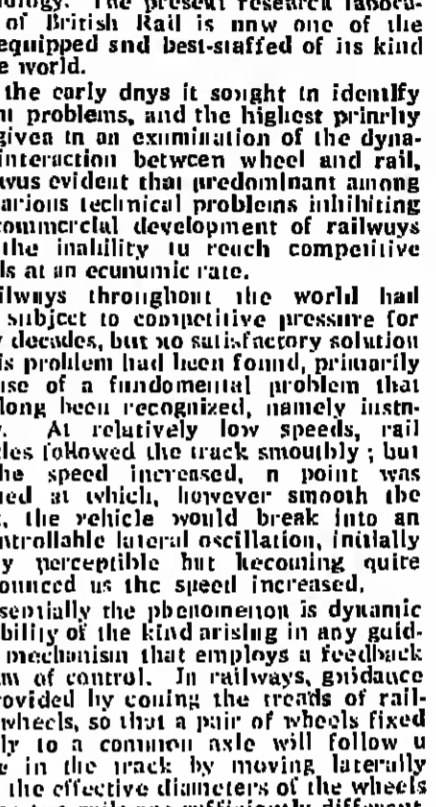
Unit costs will therefore diminish with a consequent increase in traffic, and more freight as well as passenger traffic will be encouraged to use the system. Further technical improvements, for example in signalling investment to improve track traffic-handling capacity, will also be stimulated.

Such a beneficial change from a decaying to a growth industry can, however, only proceed to a limited degree, as the convenience of the private car will not be readily abandoned. The fullest development of ground transport in the future therefore requires not only a road/rail freight system (on which some work is being done) but the proper integration of the convenience of the private car with the economy of rail. This will require a radical reconsideration of the respective roles of these two modes of transport.

The author was until recently deputy member of British Railways for research and engineering.

How BR got back on the right track

by Sydney Jones



Experimental advanced passenger train at 125 mph with 8 per cent tilt round a curve.

Modern science has tended to find its earliest market outlets in the sophisticated "science-based" industries such as aeronautics and electronics: it is comparatively rare in see industrial applications on a substantial scale, due in part to long term lack of competition.

But when competition becomes explicit and threatening the response can sometimes be dramatic. The case of road versus rail networks is a case in point. It resulted in a vigorous manner and solving one of its formerly major problems—the inability to reach competitive speeds economically.

About 15 years ago the British Transport Commission decided to build a large research laboratory, costing over £1m, as the first step in developing a competitive technology. The present research laboratory of British Rail is now one of the best-equipped and best-staffed of its kind in the world.

In the early days it sought to identify urgent problems, and the highest priority was given to an examination of the dynamic interaction between wheel and rail, as it was evident that predominant among the various technical problems inhibiting the commercial development of railways was the inability to reach competitive speeds at an economic rate.

Railways throughout the world had been subject to competitive pressure for many decades, but no satisfactory solution to this problem had been found, primarily because of a fundamental problem that had long been recognized, namely instability. At relatively low speeds, rail vehicles followed the track smoothly; but as the speed increased, a point was reached at which, however smoothly the vehicle would break into an uncontrollable lateral oscillation, initially barely perceptible but becoming quite pronounced as the speed increased.

Essentially the phenomenon is dynamic instability of the kind arising in any guidance mechanism that employs a feedback system of control. In railways, guidance is provided by coning the treads of railway wheels, so that a pair of wheels fixed solidly to a common axle will follow a curve in the track by moving laterally until the effective diameters of the wheels on the two rails are sufficiently different.

When the pair of wheels meets a disturbance with the rail, it will oscillate laterally with a motion that, in a non-dissipative system, may be expected to diminish as an exponentially decaying wave motion, with a wavelength along the track depending only on the coning angle of the treads. The frequency is therefore proportional to the forward speed.

The lateral oscillations are set in motion by forces between the wheels and the rails; and as the speed and frequency rise, so do the forces, ultimately to a degree at which "creep" becomes important, the amplitude of the lateral movement increased, and energy is fed from the forward motion to the lateral oscillation. In extreme cases the lateral motion increases until limited by flange constraints; considerable forces can then come into play and there is a danger of the vehicle leaving the rails.

The problem, so simple to describe but so complex in reality, proved impossible to solve over many years. Only recently has research work in British Railways yielded success; to the degree that it is now possible to design railway vehicle suspension systems capable of stable speeds up to 300 kilometres an hour and running, in an economic manner, at beyond.

This success could not have been achieved without the employment of a mixed team of science-based engineers' with experience of both railway engineering and allied problems in other fields (notably aircraft vibration phenomena and closed-loop stability criteria), and equipped with large computing facilities and modern instrumentation.

The work, which was recognized with a McRobert Award in 1976, stimulated thinking about the optimum design of trains, and led both to the design of the bogies for the High Speed Train and to the concept of the Advanced Passenger Train (APT).

The High Speed Train represents the modern railway engineering practice which is based on a new bogie permitting train speeds of up to 125 mph (200 kph) to be achieved where track curvature is sufficiently gentle. The Advanced Passenger Train increases performance still further in a number of important respects for it allows:

- stable running up to speeds of 250 kph
- powered tilt of coaches to enable curves to be taken at speed



Pride of presidents

To attempt to pick out all the highlights of the forthcoming British Association Annual Meeting at Aston would be not only invidious but also impossible.

For those not already familiar with the way in which the BA organizes its annual meeting, and general business throughout the year, it should be explained that for the sake of convenience and also partly as a result of historical development, the sciences are divided into 17 "sections".

Sometimes a section chooses a theme to run through all its papers, for example, section L (education) this year, will speak on "Improving the quality of education".

Each section is headed by a president, a scientist distinguished in his or her own field and whose presidential address at the annual meeting is regarded by many as one of the most important statements of the year in that particular branch of science.

Section A & A' (mathematics and physics): Professor Harold Hopkins, FRS, professor of applied physics, University of Reading.

Section B/chemistry: Professor Charles Kambill, FRS, professor of chemistry, University of Edinburgh.

Section C/geology: Professor M. R. House, University of Hull.

Section D/zooology: Professor P. C. C. Garnham, FRS, emerita professor of medical protozoology, Imperial College of Science and Technology.

Section E/geography: Professor Keri Sinnhuber, professor of geography at the University of Vienna.

BA Annual Meeting August 31-September 6, 1977. Please send me further information about the Annual Meeting at Aston as soon as it becomes available.

- Attending the whole meeting
Group visits
Scientific lecture programme
Scientific and industrial visits
Career events
Young people's events

BA ANNUAL MEETING 1977, University of Aston, Precept, Birmingham B4. NAME ADDRESS

mountain environment". To what extent is the environment capable of absorbing a further increase of recreational uses without detrimental effects?

Section F/economics: Professor E. T. Nevin, professor of economics, University College, Swansea.

Section G/engineering: Sir Frederick Warner, pro-chancellor of the Open University.

Section H/anthropology: Dr M. R. A. Chance, department of etiology at the University of Birmingham.

Section I/biomedical sciences: Dr T. Vickers, senior principal scientific officer, Research Programmes Division, Medical Research Council.

Section J/psychology: Professor A. Summerfield, professor of psychology, University of London.

Section K/horticulture: Professor J. G. Hawkes, University of Birmingham.

Section L/education: Mr A. Yates, director, National Foundation for Educational Research in England and Wales.

Section M/agriculture: Professor K. J. A. Bleasdale, director, National Vegetable Research Station, Wellesbourne.

Section N/sociology: Professor N. Elias, University of Leicester.

Section O/medicine: Professor P. C. C. Garnham, FRS, emerita professor of medical protozoology, Imperial College of Science and Technology.

Section P/physics: Professor Harold Hopkins, FRS, professor of applied physics, University of Reading.

Section Q/chemistry: Professor Charles Kambill, FRS, professor of chemistry, University of Edinburgh.

Section R/geology: Professor M. R. House, University of Hull.

Section S/zooology: Professor P. C. C. Garnham, FRS, emerita professor of medical protozoology, Imperial College of Science and Technology.

can be made and the survey possibly extended to other BAYS Branches.

The objective is to study the inter-related effects of the frequency of wetting and drying of exposed metal and the deposition of atmospheric contamination.

Section T/soil science: Professor J. G. Hawkes, University of Birmingham.

Section U/soil science: Professor J. G. Hawkes, University of Birmingham.

Section V/soil science: Professor J. G. Hawkes, University of Birmingham.

Section W/soil science: Professor J. G. Hawkes, University of Birmingham.

Section X/soil science: Professor J. G. Hawkes, University of Birmingham.

Section Y/soil science: Professor J. G. Hawkes, University of Birmingham.

Section Z/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AA/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AB/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AC/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AD/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AE/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AF/soil science: Professor J. G. Hawkes, University of Birmingham.

cent Scotland, sees the need to re-evaluate the perspectives of each party as the millennium nears.

The way we see each other is always clouded and distorted by images from an earlier era.

Section AG/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AH/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AI/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AJ/soil science: Professor J. G. Hawkes, University of Birmingham.

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Section AL/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AM/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AN/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AO/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AP/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AQ/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AR/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AS/soil science: Professor J. G. Hawkes, University of Birmingham.

Coming back to British university life after five years away, one's first impression is that the atmosphere is even more depressed than one had expected.

The way we see each other is always clouded and distorted by images from an earlier era.

Section AT/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AU/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AV/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AW/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AX/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AY/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AZ/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BA/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BB/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BC/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BD/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BE/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BF/soil science: Professor J. G. Hawkes, University of Birmingham.



Dr Richard Hoggart.

The uses of education
Richard Hoggart describes his impressions of recent changes in British higher education on returning after a five-year absence

It is, however, a pity that here as elsewhere we did not think about the problem rather more. But that is the kind of thinking we do not do very well.

Of course, there were and are exceptions. The new universities were invited to think radically and some did.

I have in mind two main areas. First, thinking about the physical and social contexts of the new universities concentrated too narrowly on one form.

One by-product was an even more finely ground professionalism within given disciplines. Inevitably, the brightest young graduates did press to enter university staffs.

by the most of it is serious and carefully considered work, as are, for the moment, the proceedings of the Council for National Academic Awards.

But no matter how well some of the public services perform and in no matter what new ways, I believe it was wrong for some of our higher education problems.

The proof of the contention that the binary system goes too much with the grain of our habitual divisiveness is all around us.

Lean times do not make for generous impulses. But we should begin to think better or we will let our present situation set us in mean habits which are hard to shake when better times do come.

In each case a good course is likely to emerge, because in the end respect the chairmen and the bulk of the committee members know that people with ideas ought normally to be allowed great scope, even though not everyone would agree with any particular approach.

According to the national folk-lore, we live well with adversity. Perhaps if the adversity is a cataclysmic war, this is so. If the mood in many universities today is any guide, we do not live very cheerfully with adversity in everyday professional life.

We could be using these years more than we seem to be doing for trying out some developments which do not depend on massive new funds: such as making the binary system an example of intellectual and educational cooperation not of separatism, devoting part-time degree work which is both cheap and good, linking better with local communities, and promoting a thorough debate about the definitions of subjects and the relevance of syllabuses; in short, thinking again about basic purposes.

The author is warden of Goldsmith's College, London, from 1971 to 1976, was assistant director general of UNESCO responsible for social sciences, human sciences and culture.

Science fairs

Since its first event in Manchester in 1961 there have been 84 science and technology fairs held at 49 different centres.

Lord Rowland, writing about the one held in Salford in 1975, looked forward in the work going on in schools and colleges "in the belief that science and technology are matters of great fascination and that the work of the true scientist is as uplifting in the senses as that of the true artist".

Only one fair committee has in the past concentrated solely on technology (the "Tomorrow's Technologist" series of fairs in Newcastle upon Tyne) but every fair contains a varying proportion of technology exhibits.

This year has produced an impressive programme of fairs which starts with Dudley from March 21-25 and is followed by Worcester April 1-5, Halifax June 29-July 1, Salford July 4-8, Oxford July 8-12, Canterbury July 12-15, Aston August 31-September 7 (at the Annual Meeting).

Finally, our Northern Ireland branch is this year to include in its junior BA meeting, for the first time, a science and technology fair. This will be in late September on dates still to be announced.

AGE '77 PERSPECTIVES

A thousand people concerned with the elderly will be meeting in Harrogate, on November 1-3 for a three-day conference called "Age Perspectives '77".

The conference, mounted jointly by Age Concern and the BA brings together organisers of volunteer groups in daily contact with old people, and the doctors, scientists and administrators on whom they have to call for information and resources.

Section AG/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AH/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AI/soil science: Professor J. G. Hawkes, University of Birmingham.

Section AJ/soil science: Professor J. G. Hawkes, University of Birmingham.

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Section BW/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BX/soil science: Professor J. G. Hawkes, University of Birmingham.

Section BY/soil science: Professor J. G. Hawkes, University of Birmingham.

Handwritten note in margin: "The author is warden of Goldsmith's College, London, from 1971 to 1976, was assistant director general of UNESCO responsible for social sciences, human sciences and culture."

NOTICE BOARD

Chairman
Mr Geoffrey Duncan Chisholm, senior orthopaedic surgeon at Hammersmith Hospital and senior lecturer in orthopaedics in the Royal Postgraduate Medical School, has been appointed to the chair of surgery at Edinburgh University from October 1.

Dr Michael Brooks, of the department of geology, University College, Swansea, has been appointed to the chair and leadership of the department of geology at University College, Cardiff.

Porthcoming events
The tenth annual conference of the National Closed Circuit Television Association (NECTA) will be held at the School of Pharmacy, University of London, from March 28 to 31. Topics will include: 'Television in education and training'; 'Educational Evaluation of CCTV'; 'Equities in NECTA Conference 1977'; 'Conference Secretary, Doris Educational Television Centre, Harton Road, Dover, Kent.

A symposium on computer assisted learning is being held at the University of Surrey from March 30 to April 1. Papers will be presented on its evaluation and application in the biological, medical, physical, and engineering sciences. An exhibition of related materials will be open to the public on Wednesday and Thursday. Further details from Mrs J. Taylor, Information and Training Officer, National Development Programme in Computer Assisted Learning, 37-41 Mortimer Street, London WIN 7RJ.

The following appointments to the Harkness fellowships of the Commonwealth Fund 1977 have been made: J. P. Bahura, hydrology, University of East Anglia; P. W. P. Callaghan, business administration, Arthur Anderson and Co.; M. H. Hamner, history, Gonville and Caius College, Cambridge; A. C. Harrop, political science, Far Eastern Economic Review; P. M. Dawson, literature, Fitzwilliam College, Cambridge; J. G. Hunter, health services administration, Department of Health and Social Services, Belfast; T. M. J. Jellison, anthropology, Trinity College, Cambridge; J. R. Lewis, public administration, Pender Institute, London; R. P. H. Loxton, international relations, British Army; L. W. Mackenzie, business administration, British Gas Corporation; G. G. Magham, public administration, I.C.A.T. Academy; R. J. P. Morton, business administration, Pilkington; Mrs. S. J. Nathan, social history, New Hall, Cambridge; M. Dyer, history, Trinity Hall, Cambridge; G. M. S. Smith, Russian history, New College, Oxford; D. G. E. Siskind, business administration, I.C.A.T. Academy; H. P. J. Stamford, law, Brunel University; D. E. Waller, public administration, The Times Higher Education Supplement; A. S. White, journalism, King's College, Cambridge.

Universities
Cardiff
Director: Professor A. R. H. Ikin (School of Economics).

Edinburgh
Director: Professor A. R. H. Ikin (School of Economics).

Stirling
Director: Professor A. R. H. Ikin (School of Economics).

York
Director: Professor A. R. H. Ikin (School of Economics).

Noticeboard is compiled by Patricia Santinelli and Pauline Gamble

Open University programmes March 26 to April 1

- Saturday March 26**
- 8.05 **Diagrams** in Mathematics and Education Policy (1.0.72) (1.0.72) (1.0.72)
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COURSES

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Sunday March 27

- 8.05 **Diagrams** in Mathematics and Education Policy (1.0.72) (1.0.72) (1.0.72)
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Tuesday March 29

- 8.05 **Diagrams** in Mathematics and Education Policy (1.0.72) (1.0.72) (1.0.72)
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Thursday March 31

- 8.05 **Diagrams** in Mathematics and Education Policy (1.0.72) (1.0.72) (1.0.72)
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West Surrey College of Art and Design
Lina Garnade Memorial Foundation
Inaugural Fine Art Award 1977: £800-00

Applications from the U.K. or abroad are invited Monday 1st February 1977, which is open to artists working in any medium. Those who have completed an artistic design education within the past five years are not eligible. Closing date for applications: Friday, 20th May.

Further details and application form from: Chief Administrative Officer, West Surrey College of Art & Design, The Hart, Farnham, Surrey GU10 2DS.

Exploring deprivation

Cycles of Disadvantage by Michael Rutter and Nicola Mudge. Heinemann Educational, £6.50 and £2.50. ISBN 0 435 82851 7 and 82953 5.

The Disadvantages of Inequality: A Study of Social Deprivation by Richard Bettleheim. Methuen and Innes, £4.95. ISBN 0 354 04047 2.

Shortly before Sir Keith Joseph's very public conversion to the benefits of inequality, determined by the "free market" to be topped another, never very deeply looked, set of British prejudices by disinterfering the problem family. There were, he suggested, a small number of families who were a burden on the state in a time of rising affluence because their parents reproduced themselves in generation after generation through some cycle of transmitted deprivation. Sir Keith's speeches gave a further boost to the already hot political and academic controversies over poverty and inequality in Britain, and indirectly stimulated the production of these two books.

With the SSRC, the DISS set up a Joint Working Party on Transmitted Deprivation which commissioned a member, Professor Michael Rutter, to carry out a review of any relevant literature (to declare an interest, after the work had been completed I too became a working party member). In order to avoid some of the more obvious traps set by the notion of deprivation transmitted among a few families, the authors rightly felt they must extend their scope to look at a wider range of disadvantages and inequalities, continuing within as well as between generations; as well as possibilities of transmission in classes, groups and areas; and at a range of mechanisms including not only genetics and social structures but also institutions and discrimination.

They distinguish between the social determination of degrees of inequality and levels of deprivation, which exhibit remarkable continuity, and the factors governing which individuals will come to occupy the lower levels at any point in time, where the picture is much more varied.

Obviously the task of reviewing the literature covering this field is not possible: all human life is there. Moreover the relatively sudden arrival of policy issues such as transmitted deprivation ("hurdled wives") is another such issue seems to catch the academic community with their trousers down, so that anyone looking for policy-related evidence must adapt material collected by other specialists for other purposes related to other controversies. There are problems of building bridges of continuity between the "trailed incompetencies" of the separate specialist fields of research. How could anyone master and order sufficient material even to describe, let alone contribute to, such a range of controversy?

In fact Cycles of Disadvantage is a monument of achievement. The authors attacked their enormous task with remarkable determination, to produce an invaluable commentary on almost 1,500 varied references. The material covers fields as disparate as income and housing distribution and policies, intellectual attainment, social mobility, delinquency, subnormality, psychiatric disorder, parenting behaviour, and ethnicity. The discussion incorporates perspectives and insights from specialists as far apart as genetics and economics at one end of the spectrum to social psychology and labelling theory at the other. Within their chosen limits this review of the literature achieves a degree of comprehensiveness, rigour and clarity of exposition which quite disarms criticism. It also defies summary and abstraction to pick only one example, I found the discussion of genetic factors in attainment remarkably balanced and constructive, view of a very hotly controversial area.

To the end the shoddy thinking of the original notion of transmitted deprivation is shot to ribbons, and paradoxically the very thoroughness of the review calls into question the whole enterprise of the working party.

Any limitations of the book stem from three sources which are only partly in the control of the authors. First, as they point out, such a review is dependent on its sources and the balance of research interest has been biased in particular ways, for example between social factors in discussions of income and housing disadvantage, as opposed to individual factors in other areas such as parenting. (However, this only partly explains the neglect of the situation of women in both these books.)

Second, they have not included discussions of research on policy intervention and outcomes, which are dealt with to some extent. This is understandable given their remit, the status of research in this area, and the lack of good intervention policies. On the other hand, the useful description of the very patchy pattern of failure and success in Operation Headstart and our own Educational Priority Areas (EPA) cries out for some further analysis of what went wrong on the policy-making as well as the implementation level. And although some mention is made of the schools and building societies in transmitting and confounding disadvantage, there is no adequate discussion of the workings of government bureaucracies, such as the School Broadcasting Council or the employment services. Indeed, surely, conceptually, there is no limit to the range of studies of government policy-making on issues of inequality.

Third, there is the related question of research method. The authors rightly assert that as the problems and solutions of deprivation are multifarious, the search for one "correct" research approach would be silly, and as already noted they underline the bias in particular pieces of research. On the other hand they do not explore sufficiently the limits imposed by research methodology.

Partly because of restrictions of space, but also because this is the type of research which predominates in the literature reviewed (and one suspects the type favoured by the authors), many of the findings are in the form of associations between "factors". A typical research design looks at contrasting situations, measures certain inputs and outcomes, applies mathematics to the resulting measurements, and makes informed guesses as to which economic changes to aim, which you cannot stop, but against which you provide shelter.

Although the publishers claim that this view is non-partisan, one suspects that Sir Keith Joseph would find much to agree with. And again, the authors (whose hearts seem to be in the right place) are unfortunate in that his book is published at a time when it is manifestly not agreed that inequality is too great and the poor all disadvantaged in circumstances being advocated against the unemployed, while at the same time an explosive pressure is building up to restore or even increase income differentials. All too clearly, inequalities are not merely maintained but increased manifestations of industrial, professional and political power.

For, as the authors recognize, the phenomena under discussion are difficult to explore because not merely "factors" but the whole notion of the separation of factors, such as "genes and environment,"

Books

Status in industry
The Achievement Principle in Work and Social Status by Clans, Uffe. Edward Arnold, £5.95 and £2.95. ISBN 0 7131 5892 1 and 5893 X.

It is good news that the work of the German sociologist Claus Uffe is now beginning to appear in English. While this book, a translation of *Leistungsprinzip und soziale Status*, is an early piece of his doctoral thesis, published in German in 1970, and gives only a glimpse of his contemporary thinking on the achievement principle in English.

Its theme is that changes in the nature of work in modern industry, together with wider social developments, have eroded the social base of the achievement principle, leaving shift from continuous to discontinuous status organization, in the former situation the work role in any supervisory function incorporates and transcends the skills prescribed in the positions beneath it in the hierarchy. In the latter, which Uffe sees as increasingly typical in modern industry, the supervisor's work is quite different from that of his subordinates and he does not share their skills. It is therefore difficult to assess the precise difference between a simple and a complex status. Also, the area of discretion open in the subordinate increases and his loyalty has to be secured through normative devices.

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The achievement principle is

Colin Cronin

Essays on Hayek

EDITED BY FRITZ MACHLUP
Foreword by Professor Milton Friedman

Contributors: William F. Buckley Jr., Goldfried Dietz, Ronald M. Harnett, Shirley Robin Letwin, Fritz Machlup, George C. Roche III, Arthur Shafer

Friedrich Hayek's influence has been tremendous. His work is incorporated in the body of technical economic theory; has had a major influence on economic history, political philosophy and political science; has affected students of the law, of scientific methodology, and even of psychology. So writes Milton Friedman in his foreword to this volume of essays presented at a special meeting of the Mont Pelerin Society in August 1975, devoted to an appraisal of Hayek's work. The essays deal with a wide range of Professor Hayek's scholarship, and a full bibliography of his work and excerpts from the citation accompanying his receipt of the Nobel prize are appended.

Japanese Foreign Policy

1869-1942
Kasimigaki to Miyakezaki
IAN NISH

Traces the pattern of Japan's pre-war foreign policy in the light of the personality and thinking of her individual foreign ministers. Dr Nish shows how the increasing pre-occupation with warlike situations is reflected in the transition of the name Kasimigaki to the Foreign Office, to Miyakezaki, the War Office. Foreign Policies of the Great Powers Series

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Routledge & Kegan Paul
39 Store Street, London WC1

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BOOKS

Revolutionary puzzles

The Russian Revolution: A Study in Mass Mobilisation by John F. H. Keep

Was the October Revolution a mass uprising or merely a coup d'état carried out by a few conspirators?

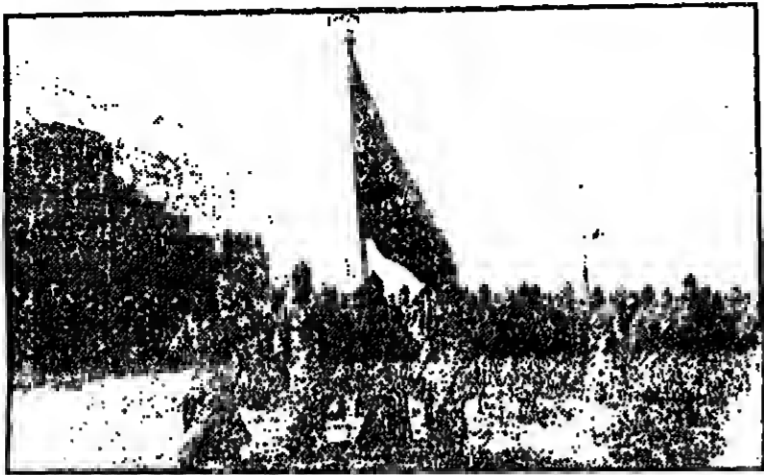
Professor Keep's method is to examine closely the various institutions through which mass aspirations for change were mobilized.

The result is very different from most accounts of the Russian Revolution: the party is fighting at the top, about which we are already well informed.

The detailed and simultaneous unravelling of high and low politics does not make for easy reading.

Keep is a sober and reliable guide, and keeps a grip both on the real world and on his main themes.

Most of them, especially the younger ones, could read and perhaps write indeed Keep quotes



Parade of Red Army troops on the Red Square, November 7, 1925.

one source which suggests a literacy rate of nearly 80 per cent among workers in 1918.

Once the old regime was eliminated, the workers tried through their new organizations to win economic security and some measure of control over their own lives.

In interpreting the peasant movement, Keep takes a strongly non-Populist and anti-Murks line.

The war, he believes, considerably deepened the necessity of traditional distrust of outsiders, especially privileged outsiders.

As might be expected, Dr Zhivkova contrasts Britain's policy unfavourably with that of the Soviet Union.

Diplomatic shortcomings

Anglo-Turkish Relations, 1933-1939 by Ludmila Zhivkova

The author is Minister of Culture in the Bulgarian Government and daughter of the First Secretary of the Bulgarian Communist Party.

Dr Zhivkova traces in some detail the course of British diplomatic endeavours to gain Turkey's participation in the war on the Allied side.

It could, however, be argued that the matter is now in a particular interest: the shortcomings of Britain's pre-war diplomacy in relation to Eastern Europe are already too well known in the English-speaking world to need further underlining.

Great play is made in the publishers' blurb with the "wide range of hitherto unavailable documents and books" used by Dr Zhivkova.

As might be expected, Dr Zhivkova contrasts Britain's policy unfavourably with that of the Soviet Union.

Revised version

The Russian Version of the Second World War: The History of the War as Taught to Soviet School-children

It was an excellent idea to produce a short book showing what Soviet schools tell about the Second World War.

The first thing that western teachers, and their pupils, will need to know is the immense scale of the Soviet war effort.

Although the blurb on the dust jacket asserts that "peasants, and not industrial workers, were the main driving force in the revolutionary process".

There are also some notable omissions of political events, the secret additional protocol to the Ribbentrop-Molotov Pact of 23 August, 1939 by which the fifth part of Poland was delimited.

However, when an author has already done so much, it is difficult to regret him with what he did not attempt.

Literary groups

Russian Modernism: Culture and the Avant-Garde, 1900-1930

Apert from detailed analyses of poems by Mayakovsky and Kuznetsov, this collection of essays is not specifically addressed to specialists.

The usefulness of the term 'avant-garde' is, however, well illustrated by the impressive analysis by Malinvald and Gennady Shakhmatov's long poem through 'Tomb Breaking'.

This piece is one of the best high points. Two other excellent essays are clearly Malinvald's and Gennady Shakhmatov's.

Geoffrey Wheeler

Landscape change

Order upon the Land: The US Rectangular Land Survey and the Upper Mississippi Country

Few demonstrations of man's apparent supremacy over the physical environment are more strident than the vast spread of cultural anonymity and uniformity that is laid out in thin veneer over the richly diverse physical landscapes of modern North America.

The United States rectangular survey, which organizes land into six-by-six-mile townships divided into 36 sections of one square mile each.

Originating with the Ordinance of 1785, the federal survey may have been inspired by European precedents as old as antiquity.

It is to be hoped that the book will be widely used in the first part of this book investigates the historical origins of the

Elliptic problem

An Introduction to the Mathematical Theory of Finite Elements

The history of mathematics shows that it is by no means overdone to quote advanced mathematical concepts or techniques to be successfully applied to physical problems.

The mathematics of finite elements provides a modern example of this process of evolution, which occurred over less than two decades.

Comprehensive as it undoubtedly is, the book nevertheless does not exhaust the theory.

Graham Flegg

BOOKS

Phases

Three Phases of Matter by A. J. Walton

The factor that determines the phase—solid, liquid or gas—of a substance exists in whether the thermal energy of its constituent particles is greater or less than the intermolecular attraction.

Having discussed the general character of the survey, Johnson proceeds in a detailed examination of its implementation and functional impact in the Upper Mississippi Hill Country.

Clearly the range of material that must be included in such a general work is immense.

Subjects are presented in a curious order.

G. A. Cox

Plasma theory

Plasma Physics by H. G. Haines

This short book on plasma physics is based squarely on third-year undergraduate and postgraduate courses given by the author who is a reader in physics at the University of Glasgow.

Some of the more basic elements of the subject, such as the relative magnitudes of characteristic lengths and frequencies could have been more clearly expressed.

Important subjects omitted from the book include high frequency cold plasma waves, bremsstrahlung and other radiation processes.

However, in a book of only modest length many elements of plasma theory are covered well, and it will be a useful addition to those requiring a first textbook.

M. G. Haines

Least action

Classical Field Theory by D. E. Soper

This principle provides a mathematical method that is common to classical mechanics and quantum mechanics.

The mathematics of finite elements provides a modern example of this process of evolution, which occurred over less than two decades.

Comprehensive as it undoubtedly is, the book nevertheless does not exhaust the theory.

The purpose of the book is to emphasize the simplicity and the range of applicability of the principle of least action.

H. G. Hopkins

Advertisement for Macdonald & Evans Annotated Student Texts Series, listing various titles and authors.

BOOKS

Disciples and adversaries

Bergson and his Influence: A Re-examination by A. E. Pilkington...

Dr Pilkington's study, Bergson and his Influence, serves three distinct purposes...

finer outlined by the four writers. Pilkington has admirably achieved his aim...

Pilkington's stated aim is to go beyond admitting the existence of a Bergsonian 'Influence'...

Will Valéry, the concept of influence suffers a new blow. The poet related to Bergson...

The next example, Prunet, does not restore the validity of the concept of influence...

A literary artist

John Stuart Mill by R. J. Halliday. Allen & Unwin, £5.95 and £21.95...

Unlike Gertrude Himmelfarb's recent book on Mill's Liberty...

As a general survey of Mill's thought, however, August's book has nothing to recommend it...

As a general survey of Mill's thought, however, August's book has nothing to recommend it...

The turning point in Mill's intellectual development for Halliday, as far as many other commentators...

Naturally, this is but a bare outline sketch of a thesis developed in much detail...

It is all the more surprising, therefore, that in his brief preface...

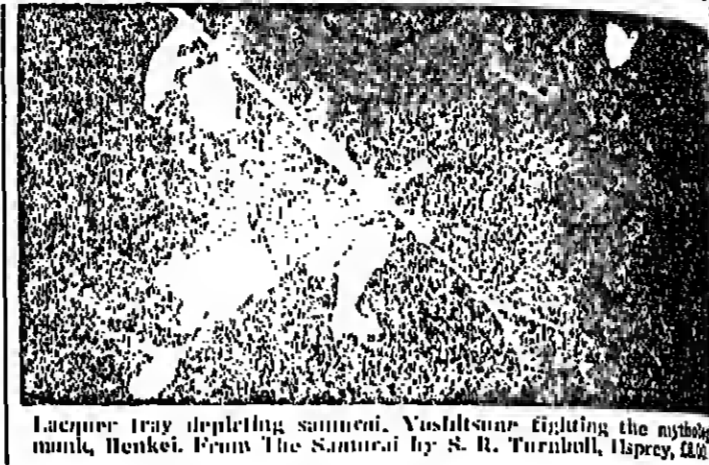
Bergson and Prunet between lived and measured time, their common attitude to language...

Greater similarity should have been noted here, a deeper divergence...

With Benda, influence is dealt a mortal blow. He had his knowledge of the past...

Pilkington's conclusion opens so many new avenues that it could be examined into a second volume...

Ninette Bailey



Lacquer tray depicting sainted, Yashtasur fighting the mythical mummy, Henkei. From The Samurai by S. R. Turnbull, Isprey, UK.

Politics rejected

Epicurean Political Philosophy: the Epicurean nature of Lucretius by James H. Nichols...

Nichols' plan is to study Epicurus' political philosophy as it is transmitted to us in the Latin hexameters...

There are several reasons why Nichols remains a difficult man to focus clearly. He was unfortunately in his original biography, J. T. Coleidge...

Hidden greatness

John Keble: Priest, Professor and Poet by Brian W. Martin...

There are several reasons why Keble remains a difficult man to focus clearly. He was unfortunately in his original biography...

Then, in a century in which all the great men were constantly clung to and developing...

He always underrated the strength of the Protestant tradition in Anglicanism. He treated the problem, so intractable from an Anglican point of view...

Now all this suggests a rather simple, conventional figure. Keble was not; it is one of the merits of Mr Martin's sensitive book...

The Grammar of the Novel: Selected Prose 1959-1974 by James McAuley...

Reading through this collection of essays published just before the untimely death of this year's Australian poet and critic James McAuley...

Of these essays, the four on Australian poets (Shaw Neilson, Judith Wright, Kenneth Slessor and Kenneth Dobson) are the finest...

Handbook: Librarian's Handbook, compiled by L. J. Taylor...

Handbook: Librarian's Handbook, compiled by L. J. Taylor, contains as far as clearly has to do with the subject...

Origins of a myth

John Arbuthnot: The History of John Bull edited by A. W. Bower and R. E. Erickson...

The History of John Bull belongs to that special kind of literature whose influence has been much greater than people's readiness to read it...

Some of the sketches of national characters are done with a simple grotesquerie, and there is some good dialogue in Scots when sister Peg (Scotland) is on the scene...

Paradoxically, this was a Tory accommodation with France, personified as Lewis Baboon...

Against the modern tide

The Grammar of the Novel: Selected Prose 1959-1974 by James McAuley...

When McAuley moves away from his immediate interest to readers in England, he gives the impression of a mind which is not at home...

Of these essays, the four on Australian poets (Shaw Neilson, Judith Wright, Kenneth Slessor and Kenneth Dobson) are the finest...

Tradition: Morris Dance at Revesby, reproduced from a manuscript of 1779...

Yorkshire: Essays in the Economic and Social History of South Yorkshire...

An old quarrel

Ballad Studies edited by E. R. Lyle...

This collection of specialist articles appears with a thoughtful reconsideration of an old quarrel...

The five pamphlets have indeed sometimes been thought to be by Swift, and were included in some editions of Swift's works...

In both the introduction and the notes, the editors are highly informative and helpful. There are a few minor slips or omissions...

Reviewers

Among this week's reviewers: Dr Ninette Bailey is senior lecturer in French at Birbeck College...

C. J. Rawson is professor of English literature at Warwick University and has published extensively on eighteenth-century English literature...

Geoffrey A. Hosking is director of Russian studies at the University of Essex and has published extensively on the Russian Revolution...

University and author of Mothers Alone: Poverty and the Fatherless Family.

The Future of Adult Education: Examines the psychological and psychical effects—such as disorientation, withdrawal and helplessness—on old people entering a long-term care institution...

MATHEMATICS OF THE UNIVERSE by P. H. Francis. Includes sections on The Straight Line and The Glanville Press.

Jossey-Bass Publishers. 44 Hatton Garden London EC1N 8ER. Includes titles like Sociological Methodology 1977, Last Home for the Aged, The Future of Adult Education, and The Craft of Teaching.

Equipment trends

Sir—Roy McAleese quotes THEES, February 181 the example of closed circuit television investment in the early 1970s (currently the 1960s, as well?) to chide me for wanting educational equipment to lead rather than follow developments in other fields. In actual fact he has cited the prime example in support of my argument. A rapid and expensive phase of CCTV installation followed various DES reports and recommendations during 1965-66 and—in the case of universities—the publication of the Brynmor Jones report in 1965. In the great majority of institutions these installations were designed to be facilities to closely parallel as the quite generous funds permitted by broadcast television studios and related facilities. Not surprisingly, producers and engineers were wooed away from the BBC and ITV to make their own equipment, and they in turn reinforced the concept of CCTV "Studio Service". Now it cannot be denied that in the long term higher education has been enriched by the infusion of professional broadcasters and media men. The cost however of wasted and unneeded facilities has been great. This would not have occurred had there been more attention paid to the teaching and learning requirements of the situation. If the educational use of technology had been subject to the same sort of discipline that is customarily applied to, say, investment in new industrial plant. Unfortunately, there is evidence that a similar error of judgement may be recurring, and equipment and procedures from other fields (computers? telecommunications? data storage and retrieval?) may once again exert a degree of influence on educational practice and investment unwarranted by any systematic analysis of actual pedagogic requirements. It is now 16 years since the appointment of the Hale committee and 14 since that of the Brynmor Jones committee; experiences of recent years in higher and further education suggest very strongly that the time is ripe for a new high-level inquiry into the organization and methods of teaching and learning in the post-secondary sector. Yours faithfully, DERRICK UYWIN, Educational Research and Development Unit, Queensland Institute of Technology, Brisbane, Australia.

Film costs Sir—I am not sure on what basis the figures which suggest that the postgraduate diploma in film studies at the Slade School of Fine Art costs 26 per cent of the cash for the benefit of only 7 per cent of the students were originally calculated, but I do know that, at a staff meeting last week, Professor Gowing withdrew these figures. Taking into account the fact that MPhil and PhD students (who have only started to be admitted this decade) did not from the beginning of film studies at the Slade) profit from the diploma course screenings, and that expenditures on film studies are not limited to expenditures on the diploma course, I would have estimated that 12 per cent of Slade students consume approximately 12 per cent of the annual grant. Moreover, when less than 12 months ago I discussed possible economies on the course with Professor Gowing, I was encouraged to go ahead to run the best possible course. Yours sincerely, JAMES LEABY, Director of Film Studies, Slade School of Fine Art.

Pope's hypocrisy Sir—Douglas Brooks-Davies calls James Reaney's "Pope's Hypocrisy" (THEES, March 4). Might one not—offer a glance at Aristotle—see as much value in that tendency as in those towards scapegoat, forgery, or maltreatment of whom the CMAA has perhaps had volumes yet to be released—with some reference to the verse of Spenser, Milton and Shelley? Yours faithfully, M. HARDMAN, Department of English, Warwick University.

Frazer and his influences

Sir—As we currently engaged in writing a biography and editing the letters of Sir J. G. Frazer, I should like to comment on Professor Leach's remarks on the newly reprinted Golden Bough and its author (THEES, February 25). By now, all who are interested know that he has avoided the opportunity to disparage Frazer, and one sees that it is still the case that nothing Frazerian pleases him. His procedure is to make Frazer out to be a total waste of time and then to profess mystified amazement that anyone can ever have found him or even worse find him, of interest now. I should like to suggest that there is more to Frazer than Leach has led the reader to believe. Thus, one of his main points is that Frazer's only intellectual hegemony was William Robertson Smith, and that Frazer's few intellectual ideas were tired Smithian hand-me-downs, and unimproved ones at that. But the letters and diaries show clearly that by no means the only important early intellectual influence on Frazer—Henry Jackson and James Ward must be counted as formative in the early years at Trinity and the Scottish Enlightenment as expounded by his Glasgow professor John Veitch stands behind them. Frazer's characteristic psychology—his interest in mental states rather than more overt behaviour—was early in place, for it is evident in his very first classical and philological efforts, which means that no great alteration in general orientation was required of Frazer when he started doing anthropology under Smith's direction. The comparative method, of which Frazer was at least the most indefatigable practitioner, in any systematic analysis of actual pedagogic requirements. It is now 16 years since the appointment of the Hale committee and 14 since that of the Brynmor Jones committee; experiences of recent years in higher and further education suggest very strongly that the time is ripe for a new high-level inquiry into the organization and methods of teaching and learning in the post-secondary sector. Yours faithfully, DERRICK UYWIN, Educational Research and Development Unit, Queensland Institute of Technology, Brisbane, Australia.

BEF constraints Sir—Mr Nokes' clarification (THEES, March 4) of Stephen Colson's rather disturbing report on current BEF degrees (THEES, February 25) was most welcome, but he should recognize also that some of the constraints imposed by the Council for National Academic Awards policy are contributing in no small way to the very problems he is discussing. It is fair to say that the CNA does not prescribe general patterns for courses, but it does promote inflexible course structures by, for example, discouraging joint teaching of certificate and degree students and common teaching across two years of a course. There is much to be said for both these practices and no evidence against them. It is just such constraints that limit the types of courses that can be mounted and make it more difficult for polytechnics to provide both for three-year BEd and four year honours BEd programmes. At the North Riding College of Education, validation by an enlightenment university enables us to mount certificate education, DipHE, BEd, and BEd (hons) programmes with no difficulty at all, and to offer a variety of options unrivaled, to the best of our knowledge, by any institution twice our size. The logistical problems to which Mr Nokes refers arise directly from the kind of constraints imposed by his council, and the inevitable search that then follows for more interlocking programmes of equal quality of teacher education. The Secretary of State herself has rightly expressed concern over this alarming slide away from professional courses, but the root causes of this malaise have not been widely recognized. The "sluggish progress" made by some of the courses under consideration by the CMAA could well be a measure of the council's own failure to advise its clients of alternative approaches to the numbers game rather than of "difficulties

Handicapped students Sir—Attention has been focused on costs per student in further education, and will no doubt be addressed to the conclusions of the Warnock Committee inquiry into special education. It is not uncommon pain and disappointment, and of unnecessary cuts in time and money can be known to few educational experts. It is that deriving from the increasing and welcome applications for entry into vocational courses of all sorts by high ability candidates with non-traumatic handicaps. Course qualifications are a minefield, and no doubt liberal decisions are taken by many admissions officers. But nothing can easily be experienced, having been from time to time in integrated education, when they discover that subjects which qualify them for grants do not qualify them for consideration. I have had applications from people with very varying disabilities who have had the same frustrating experience whether seeking to business, environmental or liberal studies. Liberal decisions cannot always be made for the lack of O-level mathematics, or for "non-academic" A levels that have been misguidedly chosen. The cause of integrated education may be damaged by ignoring this, or, more likely, not even knowing that it happens. Yours faithfully, S. A. BISHOP, Coordinator for handicapped students, North East London Polytechnic.

Handicapped students (cont.) Staff are facing... were reduced intake. Mr Nokes' research team could save themselves a lot of time if they caught the train from King's Cross as soon as they are appointed. The weather here is marvellous at the moment. Yours sincerely, K. E. ROBINSON, Deputy Principal, North Riding College of Education, Scarborough.

Spatial reasoning

Sir—In view of Mr Bernington's recent correspondence (February 11) regarding his "spatial reasoning and the curriculum" and the fact that which reference was made to my own studies into the spatial aspects of engineering drawings, I am permitted to make several observations. Mr Bernington's patient study serves to confirm a long-held view of mine, that many educationalists, especially in the teaching of engineering drawing and design to students, have been aware of some time. Today as our own more overseas students on conventional engineering courses are being confronted with more classroom/drawing office work for which they have neither practical nor equipped to do. In 1971 the United Kingdom engineering student population had fallen to 3.5:1, by 1975 it had fallen to 3.5:1, by 1979 it will be 3.5:1. Secondary comprehensive schools will continue to retain a certain importance for the general culture, no matter how unrelatable he is to the historical and scientific, the classicists, and the literary classes. I can understand why, from the point of view of the evolution of anthropology, Professor Leach should think Frazer a regrettable distraction. Mr Leach is also willing to admit that Frazer's importance for the history of the human mind, or third of this century, was neither baseless nor mysterious, and perhaps he is also willing, in the light of what I have presented above, to admit that it is based on a simplistic notion of a superior historical judgment of Frazer as a scholar. Yours sincerely, JIB WELSH, ALFERMAN, 211 West 23 Street, New York, NY 10011.

S.S. Great Britain Sir, I would like to draw attention to a fascinating exhibition at the Science Museum. It consists of large scale illustrations of Heron's famous ship, the S.S. Great Britain, drawn by students of the school of technical illustration at Brunel-mouth and Poole College of Art, and is quite remarkable work of enthusiasm and dedication by a group of young people. These expansive illustrations of the old ship, now being restored at Bristol, have been designed expressly to help visitors understand the construction of the vessel. The internal and external features in great detail, the drawings portray brilliantly the style and atmosphere of mid-nineteenth century sea travel. The Great Britain was scuttled off the Falkland Islands in 1937. Years later it was found that she had not broken up and in a letter to The Times Dr Ewan Charter, the eminent naval architect, suggested that as one of the world's historic ships, she should, if possible, be preserved. Thus the S.S. Great Britain Project was formed. In 1965 rescue operations were initiated, something of an operation that was raised and brought back to the Great Western Dock in Bristol, exactly where the Prince Consort launched her 127 years ago. Historical explanatory information of this quality is rare and there is need for more of this work to be done—perhaps of other forms of transport, historic houses and industrial archeology. Those professionally interested and those who might be curious to see quite exceptional work by enthusiastic young students will, I am sure, find a visit to the Science Museum well worth while. Yours faithfully, S. M. PAINE, Lecturer in charge of technical illustration, Brunel-mouth and Poole College of Art.

Melbourne watchdog Sir—You say that Australia's fifth University is "the first to build in a sort of conscience or watchdog" for the advancement of "learning" (THEES, February 11). Without wishing to speak the language of "watchdog" for the University of Melbourne? Our real conscience and watchdog is the university itself, created in 1973. This is not the governmental hierarchy of the university, and has no right to obtain information and to claim that honour for the University of Melbourne? Our real conscience and watchdog is the university itself, created in 1973. This is not the governmental hierarchy of the university, and has no right to obtain information and to claim that honour for the University of Melbourne? Our real conscience and watchdog is the university itself, created in 1973. This is not the governmental hierarchy of the university, and has no right to obtain information and to claim that honour for the University of Melbourne?

Melbourne watchdog (cont.) Sir—You say that Australia's fifth University is "the first to build in a sort of conscience or watchdog" for the advancement of "learning" (THEES, February 11). Without wishing to speak the language of "watchdog" for the University of Melbourne? Our real conscience and watchdog is the university itself, created in 1973. This is not the governmental hierarchy of the university, and has no right to obtain information and to claim that honour for the University of Melbourne? Our real conscience and watchdog is the university itself, created in 1973. This is not the governmental hierarchy of the university, and has no right to obtain information and to claim that honour for the University of Melbourne?

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TEMPORARY LECTURERSHIP

BRADFORD
LECTURER IN SOCIOLOGY

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LECTURER IN SOCIOLOGY

THE UNIVERSITY OF JUBA—SUDAN
PUBLIC ADMINISTRATION AND MANAGEMENT STUDIES

UNIVERSITY OF BOTSWANA AND SWAZILAND
LECTURER IN THE DEPARTMENT OF CHEMISTRY

BRADFORD
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